

# SUPPLEMENT.

# The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

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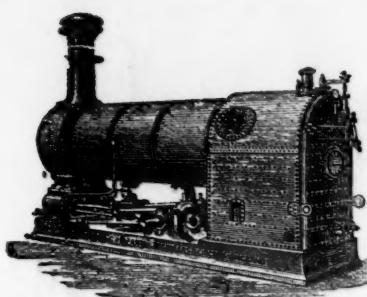
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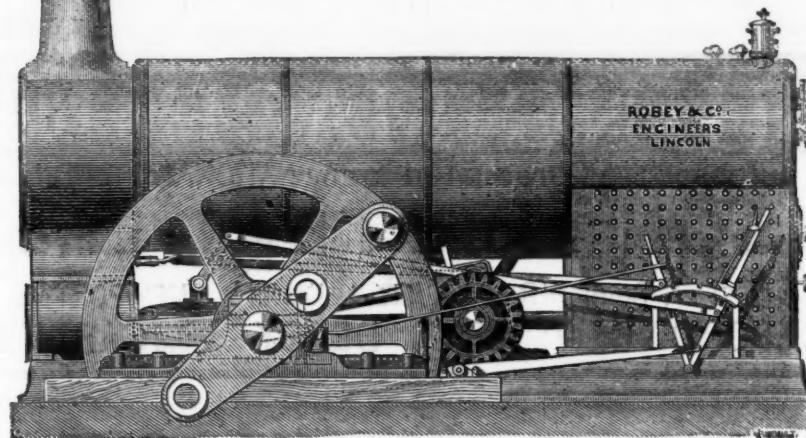
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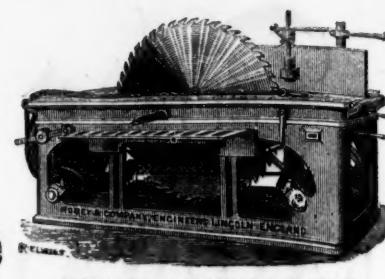


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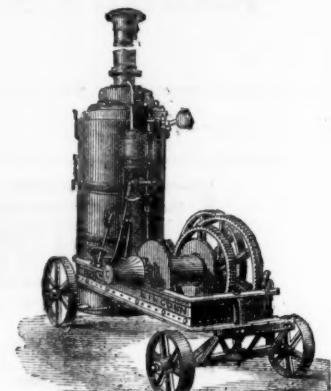
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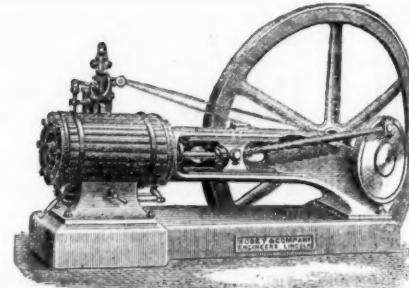
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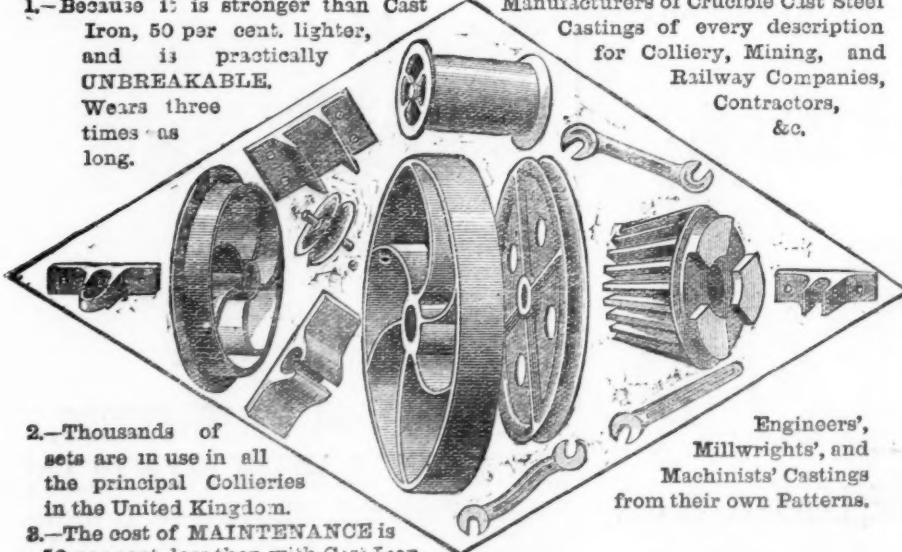
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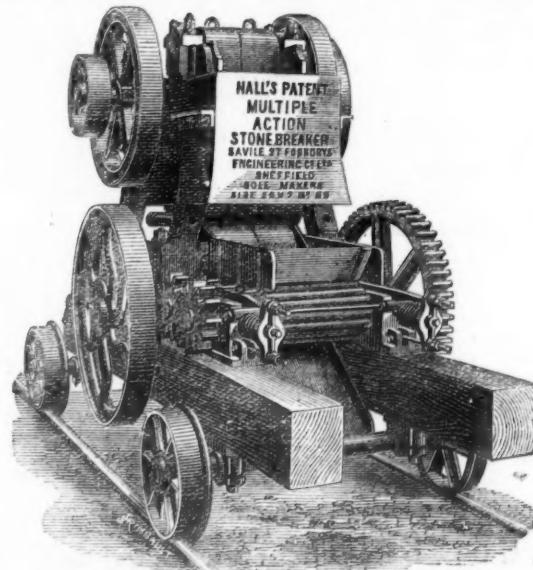
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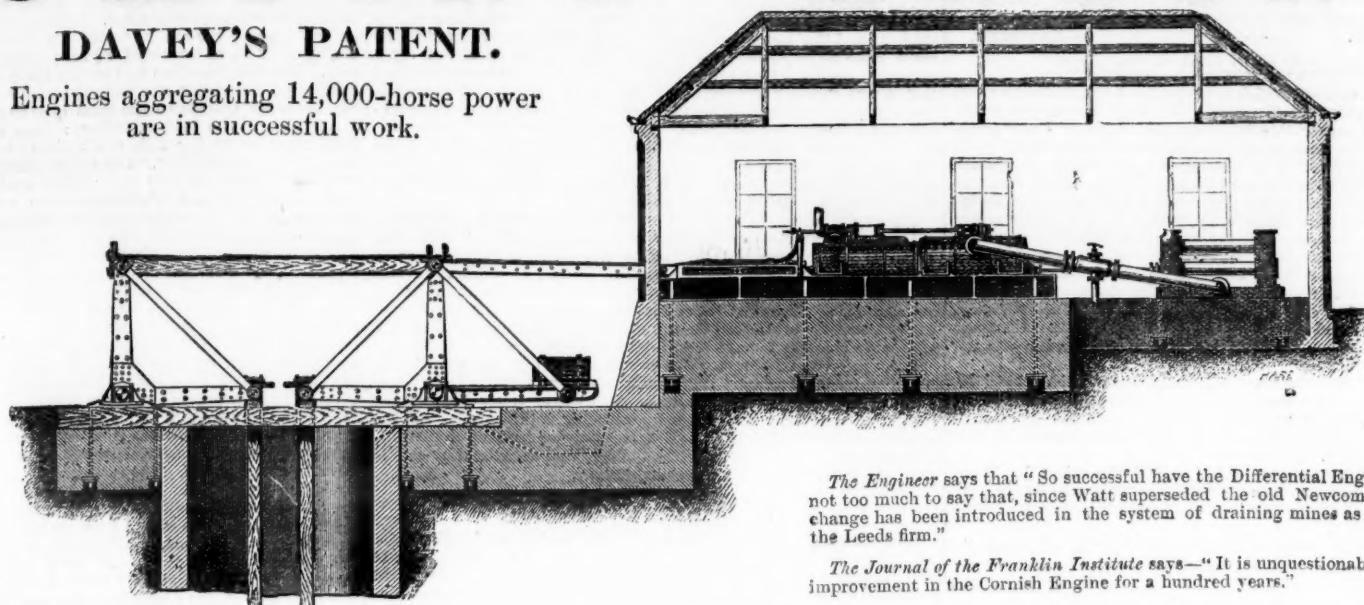
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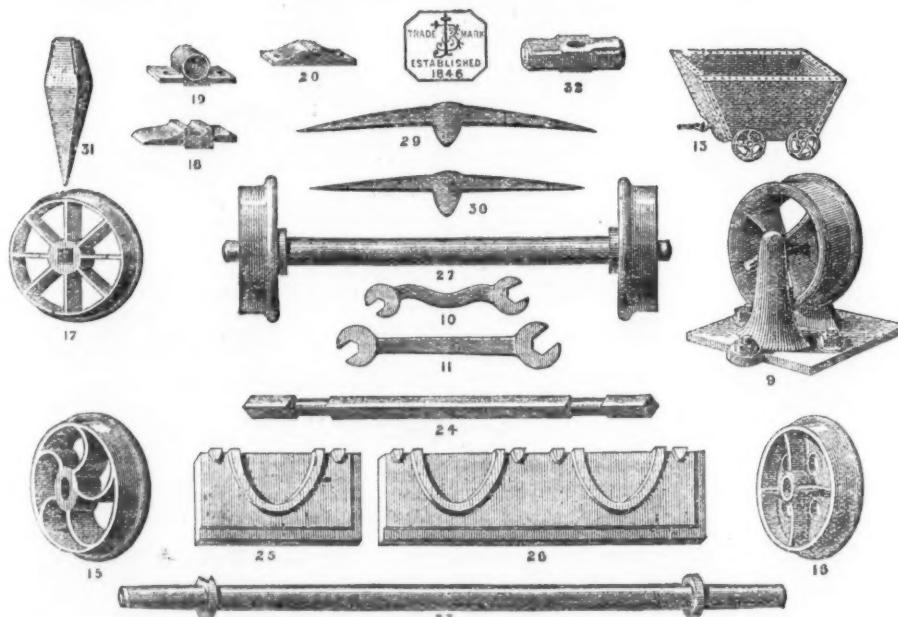
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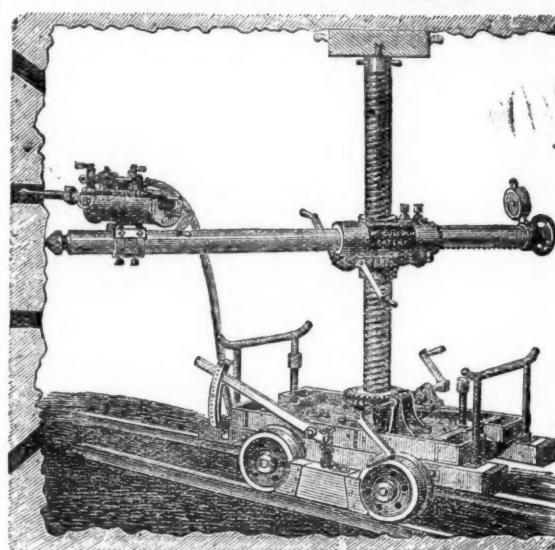


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## Original Correspondence.

## OULLWYN AND DULAIIS COLLIERIES.

SIR.—Can any of your South Wales correspondents kindly tell me if the Oullwyn and Dulais Collieries are in full work, and whether the coal is considered equal to Duffryn or Tredegar, or Llanelly, for steam purposes, and what is the daily output, &c.? Liverpool, Jan. 28.

ENGINEER.

## THE LEYCETT COLLIERY EXPLOSION.

SIR.—There is a rumour, which perhaps the Leycett inquest will verify or otherwise, that the disaster in that mine was caused by the firing of a shot. Whether this be so or not, it is only a few weeks ago that I read in the newspapers of a protest by some North Staffordshire mining proprietors or managers against the loss which would accrue to them were the use of gunpowder in coal mines prohibited. Yet to all but a mining proprietor it must seem grossly inconsistent to look up the Davy lamp, which only presents a very small flame, and, in the same workings, to explode enough gunpowder to give off a flame a yard long. In Northumberland and elsewhere Sir George Elliot, who, as we all know, is an extensive colliery proprietor as well as a clever mining engineer, has declared against the use of gunpowder for blasting purposes; and Mr. Hussey Vivian, Mr. Joseph Cowen, and Mr. Burt have followed suit. All these gentlemen are legislators. How is it that this gunpowder blasting still continues?

A substitute has not only been suggested but provided by a Mr. Marsh, who resides in or about Manchester, who has demonstrated that he can do by compressed air as good and even better work all round at a cheaper rate and without the risks which manifestly wait upon the use of powder.

Again, one of your correspondents inquired the other day if the electric light could not be made available for use in coal mines. At the Tewkesbury Collieries, near Nottingham, the electric light is already in use with good effect.

How is it that with these possibilities at hand, or, at all events, in such a position that their merits may any day be tested, the owners of coal mines are permitted to go on week by week imperilling the limbs and lives of Her Majesty's subjects with impunity?

46, Cannon-street, Jan. 26. ELLIS LEVER.

## COLLIERY EXPLOSIONS.

SIR.—Accidents in coal mines have been so often the subject of discussion, more particularly the fatalities caused by the explosion of fire-damp, that it may be thought by this time the subject is exhausted, and no further suggestions can be advanced with the view of preventing those calamities. The frequency of colliery explosions in this country, which has made the coal mining of England, and the fearful disasters associated with it, notorious all over the world, must be a matter of deep regret to all concerned. It is to be feared we have been so much accustomed to the annual recurrence of these disasters as not to be sufficiently alive to the vast responsibility undertaken in working coal mines, and such a feeling shared by those who, with their capital open out collieries, and those to whom are delegated the management of them. But there is still hope for the future, and although investigations in the past have not been followed by many propositions or plans that have seemed worthy of adoption in practice, there is, we trust, a probability that the labours of the present Commission—which have for their principal object the prevention of colliery explosions—may not terminate without finding some remedy to mitigate, if not prevent altogether, such calamities in the future.

However much may have been written on the subject of colliery explosions, and notwithstanding the large amount of evidence taken at enquiries and before commissions, the loss of life in connection with working coal mines is still very large, being on an average 1263 per year in 1877 and 1878, the deaths from explosions being over one-third of this. The output of coal in 1877 was 134,179,968 tons, in 1878 132,612,063 tons. The loss of life was about 1000 in the year 1850, and the output of coal about 50,000,000 tons. In proportion to quantity worked, therefore, the loss of life is greatly reduced in comparison with the former period. When we hear of a fatal explosion happening in a coal mine, and defects in ventilating arrangements have been brought to light, this it is thought would be considered a sufficient warning to cause precautionary measures to be taken for preventing a recurrence of such an accident. That this is so has really in some instances come to pass. The case of Lundhill and other collieries in the Barnsley district may be cited, where from more enlightened arrangements, including the increase of air in circulation, the use of self-extinguishing safety-lamps, and the more strict discipline in the mines, there has been a marked improvement as regards freedom from explosions.

The writer believes that what has been done to ameliorate the condition of the workers in the fiery coal mines of the Barnsley district may under like conditions, be brought into operation generally in every mine in the United Kingdom, and the particular dangers and difficulties of each district may be combated by making use of appliances which the practice and experience of others have proved to exercise a salutary effect in preventing accidents. It is clear that the arrangements which have been so beneficial in one district may have the like effect in another mine or district where less attention has been paid to precautions absolutely requisite to be taken in a fiery mine to keep it in a condition of safety.

Amongst the multifarious duties of a mining engineer, including the superintendance of the sinking of pits, laying out coal workings, erecting engines and machinery generally, none are more momentous than the ventilation and safe working of the mine. The workings must be so laid out that the air passages are of ample size for a large circulation, and the motive power corresponding to it, so that under ordinary conditions no fire-damp can be seen in the workings. If a sudden outpouring of fire-damp should occur and the precaution of using self-extinguishing lamps has been taken, these, combined with proper discipline, will in all probability have the effect so much desired of averting an accident. The importance of reliable safety-lamps is shown by the following instance:—A large influx of fire-damp occurred at Denaby Colliery, near Mexborough, on Sept. 30, 1879, where self-extinguishing lamps were used. The effect was to extinguish the lamps over a great distance, but no accident occurred, though upwards of 400 persons were in the mine at the time.

As in our towns when any epidemic prevails a house to house visitation is made by the authorities to discover the infected quarters, and thus a pestilence is more easily grappled with than if its sources were undiscovered, and left to exercise a baneful effect on the population, a similar visitation to this is proposed to be made to every colliery in the United Kingdom by a commission of the most able mining engineers and inspectors of the day, who should inspect every coal mine as minutely as it is possible to be done, make a thorough investigation into the methods of working and ventilation, quantity of air in circulation and fire-damp produced, condition of the goaves and of any disused or abandoned workings. After such an investigation a report of the condition would be made as to its safety, and the provisions made for preventing accidents of all kinds. Such mines as are found to be in a satisfactory condition in every respect would be passed as safe mines; in others, where greater or less defects are observed, remedies would be suggested which seemed to the inspectors imperatively required to put the mines in a condition of safety. No compromise would be made with either careless management or laxity of discipline; if there was danger threatening the workers in the mine, either arising from deficiency in the air, insecure lamps, accumulations of gas, firing shots in dangerous proximity to goaves, or other causes, the working of such mines would be stopped until the workings and ventilating arrangements were put into a condition of safety. After this had been done, and working again commenced, it would be the duty of the Inspectors of Mines to see that the new arrangements were continued, and, in fact, that the condition of the mines as to safety was still being improved rather than going back again to the former dangerous state. Difficulties would no doubt have to be encountered in the carrying out such an investigation, but the recommendations would have

the effect of permanently improving every mine, and removing a reputation of any mine being dangerous which would adhere to it consequent on the occurrence of previous accidents, so that, on the whole, these suggestions should be thankfully received. The number of mines in operation in Great Britain and Ireland in 1878 was 3968, which includes the ironstone mines of Cleveland, Lincoln, and the colliery districts, and the fire-clay and shale mines.

The recent explosion at Lycett Colliery, belonging to the Crewe Coal and Iron Company, has again turned public attention to this subject, and the more prominently as an explosion occurred in the same mine on September 12, 1879, resulting in the deaths of eight persons. So little notice, however, was taken of the latter accident that it was scarcely adverted to in the mining papers at the time. The explosion occurred in the night shift, when few men were working, which was so far fortunate. The evidence given at the inquest showed that the mine produced fire-damp largely, the cause of the explosion being the driving a certain level against the orders of the manager by the men who lost their lives, when fire-damp as an explosive mixture was driven through Davy lamp.

The explosion which happened on the 21st inst. was a more serious affair, indicating the presence of a great accumulation of gas. The force of the explosion was terrific, as is evidenced from the condition of many of the bodies recovered. Out of 68 workers in this mine 63 have lost their lives. The explosion is attributed to a blow-out shot firing the gas at the south side of the pit. The use of powder was strictly prohibited on the north side of the pit, but on the south side it seems to have been used in a limited way.

From these deplorable accidents it is hoped that some good may come, and these warnings may result in a more systematic and creditable management of coal mines. The writer trusts that mining engineers, and scientific persons possessing a knowledge of the properties of gases found in coal mines may be induced to give the results of their experience to the public, and do what they can to prevent the recurrence of colliery explosions. M. E.

## COLLIERY EXPLOSIONS.

SIR.—Each time that the news suddenly reaches us of a disastrous colliery explosion, accompanied by dreadful loss of life, people at first ask themselves and each other, "Can nothing be done to prevent such accidents?" But after a very short time the circumstance is forgotten, and no further action is taken in the matter. At the time when the news of the explosion at the Lady Fair pit reached me yesterday I was engaged in showing to the Philosophical Society of Glasgow an instrument which I have lately perfected for detecting and measuring the fire-damp in mines; and so convinced do I feel that many masters who have to deal with fiery pits would be grateful for any assistance offered to them to prevent such calamities, that I do not hesitate to ask you to give me a small space to state two facts:—(1) that this instrument (which has been named a "damposcope") may be relied upon to indicate the presence of fire-damp in so small a quantity even as one-half per cent., and to measure the exact percentage of fire-damp with which the air in any part of a mine is contaminated; and (2) that a systematic examination of the quantity of fire-damp in certain parts of a mine would often have prevented the occurrence of disastrous explosions.

With regard to the first point, it is not for me to say more than that we have put the instrument to the severest tests of chemical analysis, and that it has been found to be thoroughly reliable.

With regard to the second point I shall make two remarks:—1. It often happens in very fiery mines that, owing to insufficient ventilation or other cause, gas accumulates in certain parts of the mines and spreads. [As your report on the late explosion in the Times of to-day says:—"The cause of the catastrophe is not yet known, but it is supposed to have been through accumulations of gas in some sluggish part of the mine."] This would be prevented by even a daily inspection with the "damposcope," which would show even the smallest trace of fire-damp and set people on their guard.—2. With the coal-cutting machinery now so much employed, hundreds of tons of coal are broken off instantaneously, involving a great possibility of gas being liberated. I have detected in such a case 2 per cent. of fire-damp where no one had suspected its existence. This source of danger would be counteracted by enforcing the testing for fire-damp after each fall of the coal which has been cut.

On the indication of fire-damp reaching anything like an explosive quantity the working should be stopped and ventilation increased. One can hardly believe that any manager would willingly omit these precautions and risk an explosion by allowing his men to continue at work; but perhaps it might be advisable that the precautions should be enforced by law.

GEORGE FORBES.  
Anderson's College, Glasgow, Jan. 22.

## MINING IN IRELAND—No. V.

## CONVERSATION BETWEEN A FATHER AND SON.

FATHER.—If my memory serves me right, John, I promised last time to say more respecting Irish marble, and, therefore, ask your attention for awhile before showing the composition, according to Dr. Kane, of the coal produced in that country.

SON.—Certainly, father, you shall have my best attention, as I am greatly interested in the matter.

FATHER.—The primitive limestones of Connemara and Donegal supply white marble, which in Galway is often absolutely pure in tint, but in Donegal is more frequently of a greyish cast. The west of Galway and Mayo is also remarkable for the serpentine rocks which afford the beautifully variegated green and white marble so deservedly esteemed.

The most valuable quarries of this remarkable mineral are situated near Clifden, on the estate of Mr. Darcy; this marble is exported in considerable quantities. The principal quarries of black marble are those at Kilkenny and near the town of Galway; these are both in the upper limestone. The Kilkenny marble takes a beautiful polish, and when first cut is quite black, but the organic matter to which its colour appears to be due gradually passes off, and ultimately white marks of fossils of varied and interesting forms present themselves upon its surface. The Galway marble quarries are situated along the verge of Lough Corrib; they supply a large quantity of marble annually to London and New York, but are capable of almost indefinite development.

The sandstone rocks, as well of the older as of the newer geological formations, have furnished not only building stones and flags of good quality, of which the principal sources are in Carlow, and at Kilrush and Moneypoint in Clare, but also grindstones and millstones, which latter, especially those of Cullagh Mountain at Lough Allen and Drundowny in Kilkenny, were formerly much esteemed.

I will show you later on that Ireland possesses vast and almost inexhaustible quantities of material for statuary and building purposes, not only adaptable for domestic purposes but may also be made a source of large profits if developed and exported abroad.

SON.—Yet you tell me, father, the sanitary condition of the country is in such a sad state.

FATHER.—There is room for improvement in a sanitary point of view not only in the country and small towns of Ireland, but also the large towns are sadly neglected, not excepting Dublin, which is one of the most unhealthy towns in Europe, while the climate through damp is very mild, and by no means unhealthy.

SON.—The death rate is not so high in Belfast, Cork, Limerick, and other large towns as in Dublin.

FATHER.—No, those places compare favourably in that respect with the large towns of England, and indeed would be far healthier if a better system of sewerage were observed in Irish towns, and the dwellings constructed spacious and well ventilated, as we have them here.

SON.—The price of copper keeps going up, father, and it seems likely to advance still higher in price—a circumstance which must place copper mining in Ireland on a much better footing.

FATHER.—Some of the old copper mines have become very deep and expensive to work, and it will be more profitable to attack new and undeveloped properties, some of which I know in Ireland will yield splendid ore even at the surface, and under such conditions I need not tell you mining cannot fail to be very remunerative.

SON.—When are you to give me a description of the copper and lead mines of Ireland?

FATHER.—In our next conversation we will have something to say concerning metallic minerals. At present we will resume our con-

versation on coal:—"In 1825 the Mining Company of Ireland initiated some enquiries as to the conditions of a portion of the Connemara coal field, and had reports prepared by mining engineers of reputation, for access to which documents I am indebted to the kindness of Mr. Purdy. The coal beds in Mounterkenny Hill were found by Mr. Kenneth to consist of two distinct patches—that to the north containing 2043, and that more southerly 106 Irish acres of coal. No workings were carried on in the larger, but Tullynaher Colliery is situated in the smaller portion. In this pit, which was 22 yards deep, and very badly worked, he found the coal but 20 inches thick, consisting of 12 in. of head coal, 2½ in. of slatey coal, and 5½ in. of crow coal. The coal was then laid on the bank for 4s. 6d. per ton, but to be considered by proper workings it could be done for 3s. or 3s. 6d. Mr. Kenneth calculates the total quantity of coal in the Mounterkenny part of the field as follows:—The north portion, containing 2043 acres, averaging 2 ft. thick, gives—house coal, 667,897 tons; slatey coal, 400,820 tons. The south portion, 106 acres, same thickness—house coal, 345,869 tons; slatey coal, 207,564 tons, making a total of 1,622,150 tons, of which, however, a third must be subtracted to allow for loss in actual working for sale. Mr. Geddes examined the Tullynaher Pit almost at the same period, and reported that it showed two beds of coal, the upper or crow coal, 3 ft. thick, the second 8 yards, lower 2 ft. thick; the latter coal, which was of superior quality, was the only bed worked. The field being basin-shaped, a gully, sunk 44 yards in the centre, drained the entire. Owing to bad management the coal then cost 5s. 6d. per ton, but he says it could be raised for 3s. 4d. to bank, and, paying 9d. rental and 1s. carriage, could be placed on quay at Lough Allen for 5s. 1d. per ton. The mountains which form the northern portion of this district do not present such favourable pictures as that last described. The thin beds of coal have not as yet been traced upon them, and indeed some features in their structure render it improbable that they exist. Several thinner beds have, however, been found, and a further examination is desirable. The eastern portion of the district, separated from the last by the River Owenmore, consists of one mountain group, Slieve-a-Nieran (the Iron Mountain); its structure and stratification differ only in detail from that of the southern and western portions, and it contains also three beds of coal, of which the superficial extent is very great. The total thickness of the coal is less, however, and the strata are more broken; it has not been much worked; indeed, for a long time the southern and western divisions will fully suffice for all industrial wants. Such are the circumstances of the coal field of Lough Allen. Although subsequent examination has sobered down the expectations of its produce which were once held, it must still be considered as capable of becoming an important centre of industry for the interior of this country. The causes which led to the failure of the iron manufacture at Arigna might have acted as forcibly in Staffordshire or at Merthyr; those causes may be removed. The quantity of coal available is certainly sufficiently great for domestic trade, and it must be recollect that on the surface of hills which surround Lough Allen there is a supply of fuel, probably not inferior to that which is contained within them. I have mentioned already that Mr. Griffith considered his original estimate of 30,000,000 tons as too high. An estimate given in the Report of the Railway Commissioners in 1838 may probably be considered as embodying all accurate observations made. The Lough Allen district is there stated to contain 20,000 acres of coal, equal to 20,000,000 tons. At present there is very little coal raised; the quantity does not exceed 3000 tons per annum. Having described the geographical and geological conditions of the coal fields of Ireland, I shall now proceed to trace the composition of the coals they yield, and ascertain how far they are adapted for use. To represent their constitution I have given in every case the practical analysis, which shows the quantity of gas given off at a red heat, and that of the coke produced, the actual weight of coke being the scum of the ashes and of pure coke. The heating power of each fuel was experimentally determined, and in most instances the elementary analysis has been executed. The minute quantity of nitrogen which exists in all ordinary varieties of fuel was not separately determined in those analyses, as it does not exercise any influence on their industrial value; its amount is, therefore, in all cases included in the number given for the quantity of oxygen present in the specimen of fuel analysed. The coal of the Connaught basin is described by Mr. Griffith as intermediate to the open-burning or quick-blazing coal of Scotland and the caking coal of Whitehaven. Mr. Twigg called it a coking coal of good quality. I found it moderately bituminous, burning with flame, and leaving a white ash in moderate quantity; its only disagreeable character is a great degree of friability. I have submitted to accurate examination four kinds of it, transmitted to me through the kindness of Col. Jones, member of the Shannon Commission. I shall describe the results which I obtained—Aughaboe Coal: A rich black coal, easily broken; its specific gravity is 1.274; when heated it gives off a good deal of inflammable gas, and leaves a light porous grey coherent coke. Analysed in this way it was found to give from 100 parts—Volatile matter, 23.10; pure coke, 66.15; ashes, 10.75=100. Its economic value as a fuel was determined by measuring the quantity of oxygen it was capable of absorbing on ignition with litharge; 1 part of it reduced 26 parts of lead to the metallic state; 100 parts of it, therefore, represents 77 parts of pure carbon. The Celtnaveena and Meenasham coal are almost identical in external appearance; their specific gravities are about 1.290; when ignited they give off inflammable gas, but do not froth; they produce a moderately dense coke, and leave when burned away white ashes. Their analysis was found to be in 100 parts:—

Volatile matter .....	19.10 .....	18.90
Pure coke .....	65.87 .....	61.46
Ashes .....	15.03=100 .....	19.64=100
Ignited with litharge 1 part of Celtnaveena coal gave 26 of lead, and 1 part of Meenasham coal 25 of lead; hence 100 parts of Celtnaveena coal correspond to 77, and of Meenasham to 73 of pure carbon. The Rover coal is rather brown in aspect, and has a remarkable tendency to split into cubical fragments; its specific gravity is 1.257; when ignited it gives out gas, but does not froth; its coke is porous, slightly coherent; it contains less foreign matter than any of the other kinds; on analysis its composition was found to be—Volatile matter, 17.70; pure coke, 74.89; ashes, 7.41=100; 1 part of it gave by ignition with litharge 28.4 parts of lead; hence 100 parts of the coal correspond to 84 of pure carbon. The coal of the Tyrone basin burns rapidly, and gives out intense heat; it cakes but little, and strongly resembles Ayrshire coal. My colleague, Mr. Davey, examined the Braghovel coal from Coal Island, and the Kingarrow coal of Dungannon; the former has specific gravity of 1.266, and gave 65.9 per cent. of coke, containing 29.4; the latter had specific gravity of 1.307, and gave 66.9 per cent. of coke, containing 37.0 of ashes. The following analysis by myself gives the composition and properties of specimens of coal from New Drumglass Colliery, and from the pits of Messrs. Coulfield at Coal Island. The coal from Drumglass New Colliery is brilliant, black, friable, frequently mixed with the pyrites which oxidise on exposure to the air; its ashes consequently usually reddish. On ignition it gives off much gas, froth, and gives a light porous coke; it was found to be composed of—Volatile matter, 48.2; pure coke, 34; brown ashes, 17.30=100; 1 part of it gave with litharge 22 parts of lead; hence 100 parts correspond to 65 parts pure carbon.		

New Cross, London, Jan. 27.

## BOILER EXPLOSIONS.

SIR.—I am wishful to call the attention of the public generally and owners of non-inspected boilers in particular to the frequent explosions of steam boilers from damp brick seatings or from water getting to the bottom of boiler shells when such boilers are placed below the level of the surface of the ground immediately surrounding them. Of such a character were the two boilers that recently exploded at Rochdale and Ormskirk. That at Rochdale was corroded in that portion which rested on the side walls of the brick seating by the action of water percolating through the brickwork until it came in contact with the shell of the boiler, thereby reducing the thickness of the plates from three-eighths of an inch to the thickness of paper, and the explosion followed, killing the owner and his son, and doing considerable damage to property.

The boiler at Ormskirk had its shell reduced to the thickness of tin over many square feet in area, and so short or brittle that it could

easily be broken by the use of the thumb and finger. This boiler exploded and killed three people, and did considerable damage to the surrounding property.

This class of explosion is of frequent occurrence, and might have been prevented by inspection. A small hammer would easily have driven a hole in the plates of either of these boilers. I have no doubt that there are many boilers existing within a radius of 50 miles from Manchester at the present time in a dangerous condition, more especially small boilers, and I would strongly recommend all those who possess such boilers to have several bricks removed where they are in contact with the boiler and examine the plates for corrosion, and to strike suspected plates with a hammer or a small bar to see if they will bulge by the force of the blow, and also to try the bottom of the boiler in a similar manner, either inside or outside, or both. If the plates are found to be thin from corrosion get a boiler maker at once; it is better and cheaper to stop and pay for repairs than to allow the boiler to explode, and not only endanger the owner's life, but that of other people.—*Manchester.*

THOMAS BALDWIN.

#### TIN STOCKS.

SIR,—When speculation fills the air and madness rules the hour I am quite aware that it is a waste of time to reason upon facts. My desire, however, is to demonstrate by the undernoted figures that there is no scarcity of tin, but that, on the contrary, the supply for 1879 was 1100 tons in excess of what was taken for consumption, and this supply will no doubt be largely increased (stimulated by higher prices) during the present year.

The bold purchases which have been made for the New York market have had the effect of creating a *false deficiency* in London, but when all stocks are combined (as they ought to be for the purposes of fair consideration) it must, I think, be admitted by even the most involved that the recent advance in price from 64*l.* to 99*l.* rests upon a very obviously unsound foundation.—*Jan. 28.*

#### PARTICULARS OF COMBINED TIN STOCKS.

	Jan. 1, 1880.	Jan. 1, 1879.
Spot and floating for London...Tons	10,166	12,028
Holland.....	5,716	6,733
" New York.....	5,677	1,674
Total .....	21,559	20,435

#### RIO TINTO.

SIR,—You published a letter from me in September last, in which I estimated the Rio Tinto dividend for 1879 at 3 to 5 per cent. In November a circular was issued by the chairman of the company to the shareholders, of which the principal points are as follow:—(1) The production of copper precipitate at the mines for 1879 will be almost double what it was in 1878; (2) there is an abundance of water; (3) the shipments of pyrites have been increased about 12,000 tons, compared with 1878; (4) important advance in price of copper; (5) important reduction in costs at mines and freights; (6) further explorations prove immense value of mines; (7) experiments are proceeding to test value of new processes for reducing ore, which, if successful, will greatly increase profits. The circular concludes by stating that the report to be presented to the shareholders for 1879 cannot fail to be satisfactory.

The increased value of copper for the last three months of 1879 gives me confidence in expecting 5 per cent. dividend in April. The present appearance of the markets justly lead us to expect greatly improved results for 1880, and, taking as a basis present values, an imperfect estimate may be given of the probable profits. The value of the pyrites exported is made up as follows:—2*l.* per cent. copper at 12*s.*; 4*l.* per cent. sulphur, at 6*d.*; and purple ore, 6*s.*

#### ESTIMATED PRODUCE OF THE MINES FOR 1880.

250,000 tons pyrites for shipment at 60 <i>s.</i> .....	£750,000
9,000 tons copper, at 73 <i>s.</i> .....	657,000 = £1,407,000
<b>COSTS OF PRODUCTION, FREIGHTS, &amp;c.</b>	
250,000 tons pyrites, at 2 <i>s.</i> .....	312,500
9,000 tons copper, at 30 <i>s.</i> .....	270,000
Charges—Interest on bonds .....	£160,000
General expenses .....	65,500 = 225,500
<b>£582,500</b>	
Net profit for shareholders .....	£599,000

The above is dependent on the price of copper, sulphur, and purple ore being maintained, but, as they are more likely to rise than fall, I think the estimate is a fair one, and if realised would enable the shareholders to receive a dividend of something like 20 per cent. for 1880.—*Jan. 27.*

#### A SHAREHOLDER.

#### THE BILBAO DISTRICT IRON ORE TRAFFIC.

SIR,—It must not be premised on account of the 50*l.* paid up shares of a certain English limited company for getting, purchasing, transporting, and shipping iron ore from the Bilbao river being quoted in October last at 8*l.* to 8*l.* 10*s.*, this month at 17*l.* 5*s.* to 17*l.* 10*s.*, and last week at 39*l.*, that this traffic is undeserving of the capitalist's attention. I am prepared to show that in lieu of said undertaking locking up a large capital in 21 kilometres of railway, with wire and other tramways and incline planes, shipping channel and pier, workshops, locomotives, wagons, dredging plant, miners' cottages, &c., culminating in a shallow shifting bar harbour for the shipment of the ore, admitting only small craft or light draught steamers, with ingress and egress only in fine weather, the mountainous seas of the much dreaded Bay of Biscay, of world-wide notoriety, the ore can be transported by the practical system I propose from the point of extraction to a safe neighbouring port, with 30 feet of water at low water, accessible at all states of the tide and in all weathers by the largest steamers afloat for much under the present cost to the trading stage on the Bilbao river.

An article in the Journal pre-eminently so well informed upon all matters relating to mining interests, of which it is the able and impartial exponent, the special organ of all that relates to the extraction of the crude mineral, states—"The entrance to the Bilbao river is practically stopped during the half of each month." When it is taken into consideration the immense amount of capital expended and expended on the Tyne, the Hartlepools, Middlesborough, and the Welsh ports to effect a reduction of freight by rendering practicable the employment of a large class of vessels, the transport of coal and iron being considerably in excess of the cost of the coal and crude ore, the precited matter I have alleged in favour of a practical port of shipment being resorted to will be at once self-evident, and carrying conviction even to the casual observer that the Bilbao river, were it even endowed with the breakwater proposed by Mr. Vignoles, and of a similar proposal by Sir J. Coode, cannot possibly compete with an existing deep water, always accessible port of shipment, as proposed by me. As to the conveyance of the ore from the mines, or point of extraction, my system admits of it being conveyed at less than one-quarter of the existing cost. The gravitation system on surface roadway was actually inaugurated with great pomp at Bilbao, no country being able to vie with Spain in such functions, which terminated with the first attempt in broken wagons, smashed pulleys, piles of mineral, and torn esparto rope, presenting a ruined appearance. No renewed effort has been made, the plant has lain for 13 years without being sold. Nicholas Wood, in his "Practical Treatise on Railroads," p. 78, states—"In wet weather, giving increased velocity by reason of diminished friction, the action of the brake was almost destroyed, the attendant having no power over the loaded wagons, which run amain, destroying everything in their course, and dashed to pieces at the bottom. With very steep descents the work was laid off, on account of the weather," demonstrating the folly of applying this great source of power in Nature to a surface railway, whereas by my system it is utterly impossible to leave the rail with the greatest velocity.

I am supported by a leading Madrid paper, "El Popular," in advocating the conversion of the ore into highest class steel in Spain, the freight of the metallic ore being actually 1*l.* to 1*l.* 3*s.* and upwards per ton to Great Britain and the Continent. There is nothing to prevent, with practical arrangements, coal being delivered at 5*s.* a ton freight, and the same rate return on steel or iron. Labour is much cheaper than in England, the Basque population being as in-

dustrious and sober a race as any in the world. There is no lack of capital in Spain, and with a syndicate of leading men no doubt need exist at the present juncture of forming a powerful company, capable of carrying out the proposed system, which I promulgate with the greatest confidence.

W. J. THOMPSON.

Little Tower-street, Jan. 21.

#### CONSOLIDATED (LATE SOUTH AURORA) MINING COMPANY.

SIR,—It is some time since I have had the pleasure of perusing the columns of your valuable Journal till this week, and I am very pleased to see the great advance in all kinds of minerals. It will I have no doubt be the means of starting a great many old mines, as well as open up new ground, which will with present price of minerals pay good profits for development. I was very much surprised to see that the Olmeta Copper Mine, in Corsica, had been suspended for some time, but I am glad to see is about to be worked again shortly. I can speak from experience as to the value of this most important property, not only from its great extent but from the vast magnitude of the rich lodes contained therein. Having had over 40 years practical mining experience in all its branches enables me to give an opinion of the value of these lodes, and I have no hesitation in stating that if developed to a reasonable depth and extent very large deposits of mineral will be discovered in great paying quantities. This is not the first time I have called your attention to this property, and I hope soon to hear that good returns are being made. There are other mines which I will call attention to in next week's Journal. Southport.

JAMES RICHARDS.

#### PANULCILLO MINE.

SIR,—Noting the letters in the Journal about the above mine I should be glad to know how much saleable copper comes out of the 43,000 or 48,000 quintals of ore (each quintal being, I believe, one English hundredweight), as if 1*l.* rise in Chili bars represents 150*l.* extra profit it appears as if 1500 tons copper is what is obtained per annum (for shipment I presume), which taken at the present price here of 75*l.* per ton means a gross profit of 112,500*l.*; but, as it is almost a certainty that the price will very soon reach 90*l.* the amount will not be despicable. However, heavy sums must come off this for expenses, freight, &c., and it would be interesting if any of your correspondents could say what the net profits are. I have lately bought at above 6*l.*; but am quite ignorant of any details, or even whether there is an office in London, which I should be glad to know. Copper is about the cheapest metal going now, and great expectations of a speedy rise are anticipated, so that investment at considerably above 6*l.* will still be a remunerative one.

A LATE INVESTOR.

#### CAPE COPPER COMPANY.

SIR,—The letter of "Observer" in your last week's Journal seems to be the outcome of a sanguine disposition, nourished no doubt by the present mania for driving up, almost daily, the prices of metals and shares representing them. Is the marked reticence with respect to the Cape Copper Mine of which "Observer" complains meant to apply to its managers, or is it meant to express a regret that "men who know all about mines" do not talk about the Cape Copper Mine as much as they do about Cornwall mines? It can hardly allude to the managers, as the monthly mining reports acquaint us with all the particulars of progress and discoveries made on the spot by the mining captains. These say nothing about "splendid discoveries" at the bottom; where the yield varies between 4 and 7 tons, sometimes increasing in one direction and falling off in another, no prudent man should flatter himself with the prosperity of a mine until its profit has been actually realised. The new shaft, although it had intersected some good ore, has not yet exceeded, by the last report, 5 tons in value. "Observer's" statements would consequently appear to be rather loosely compiled. There is one point, however, on which I should incline to think most of the shareholders will agree—"Observer's" hope that no step towards smelting will be determined upon until the vote of the shareholders shall have been taken. The present rise in copper prices would benefit the Cape Copper Company to a much greater extent were it not for the loss incurred for several months last year by our 30 per cent. ores being disposed of at only 12*s.* 9*d.* per unit, or about 1*s.* per unit under its value; equal to a loss of more than 120*l.* a month.

Jan. 29.

#### SHAREHOLDER.

#### MINING IN NEWFOUNDLAND.

SIR,—In the present demand for mining shares I am surprised that no one appears to have thought of Newfoundland as a sphere for mining operations. There is an abundance of copper and lead in Newfoundland, and the cheapness of labour, the easy and inexpensive transit, and the proximity to Great Britain, should make mining a very remunerative undertaking now that there is a great and increasing demand for copper and lead. I have seen it stated that one mine, the La Manche, is estimated to produce 8 tons of lead to the fathom. The property of this company embraces an area of 3843 acres, which is held, I believe, under the Newfoundland Land Company of London on a royalty of 5 per cent. on the ore realised.

The Newfoundland Land Company also has mines on which large sums of money have been spent. Why do not the shareholders of this company take advantage of this favourable tide in the affairs of mining which might lead them on to fortune, or at any rate raise the value of their 3*l.* shares from  $\frac{1}{2}$  to par and a dividend?

A TRAVELLER,

#### LEAD MINING IN WENSLEYDALE.

SIR,—Owing to the late depression in the lead trade, together, in many instances, with the heavy duty required—from 1*l.* 6*th.* to 1*l.* 8*th.*—this industry is checked, and in places nearly suspended. This is to be regretted. The geographical situation is favourable. A few miles to the south are the well-known mines of Pateley Bridge and Grassington, to the north the equally well known mines of Swaledale, the workable geologic measures of the latter district being identical with those of Wensleydale.

The mines now working are—The Worton Mining Company, West Burton Mining Company, Wood Halls Mining Company, Apedale Mining Company, and Keld Heads Mining and Smelting Company. Mines not in operation are—The Virgin Mines, Wet Groves Mines, Bob Scar Mines, Braithwaite Mines, and the Bolton Park Mines, together with several other smaller trials.

What the non-operative mines are really like is questionable. Many of the practical miners speak favourably of some of them.

The Virgin Mine, with its vein matrix of carbonate of baryta, has doubtless a better prospect, since the railway facilities are now within four miles,

Braithwaite, too, near Middleham, is locally reputed to be a good mine.

It has stood for several years, owing to influx of water, the pumping machinery being inadequate.

A vein of solid lead ore, 6*in.* wide, is what the miners say was left, which would mean about

3*l.* tons lead ore per linear fathom—a prospective mineral wealth which one can hardly conceive being abandoned without succeeding efforts being made to reclaim it.

The topographical features of the country are very favourable for mining operations; the dale runs east and west; the 12 fathom lime crops boldly out, forming the "scar," below which the contour drops abruptly to the valley beneath. Many of the veins run north and south, cutting directly into the escarpment, and in many places they, with their tributary leads, are visible.

Until the past three years transport facilities were bad, but within that time the North-Eastern Railway Company have extended their branch line from Leyburn, right through the dale, to Hawes Junction, where it connects with the Midland Railroad. This gives direct railroad facilities with the east and west seaboard. Along the route the scenery is perhaps as grand as can be found in any of the wild and elevated moorlands of North Yorkshire. The working mines have felt the influence of the increased price of lead; still, the excessive duty, without abatement, acts as an incubus, preventing temporarily, it is to be hoped—that activity and starting of new works so long looked for and desired. Many of the mines are of long standing, and the yield has been considerable. In the West Burton Mines local interest is centred in the trial now being made in the lower beds, being deeper down in the measures than has yet been worked in this district, so that should success be achieved it will

doubtless, exert a hopeful impression, since the dip of the measures places the beds (10 fm. lime) below the present workings of many of the other mines.

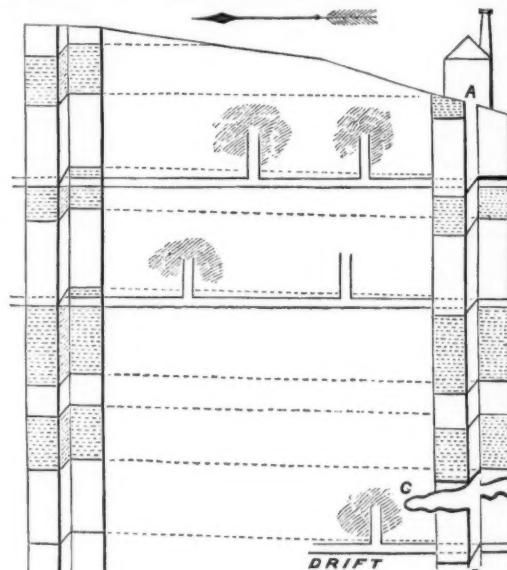
But the Keld Heads Mines are the principal mines of the district. They have been worked by the present company well nigh 40 years. The main vein, running about north and south, strikes at right angles to the escarpment into the heart of the moors, and through the centre of the royalty. The works are situated below the scar, adjoining the new station at Wensley, on the North Eastern Railway. The dressings, with crushers, self-striking jiggling machinery, round buddles, and the usual dressing appliances are here, together with entrance to mines by shaft and level, engines, workshops, and offices. The water facilities are excellent; its motive power, when required, is utilised four successive times. A little back from the mines are their commodious smelting works and condenser, and climbing up the hillside and far out on the moor may be seen the long chimney flue. But the heavy expense incurred to build a flue nearly two miles long is not an unmixed evil. If primarily built to carry away the deadly fumes, so destructive to vegetation, its economy is manifest when something like 11 per cent. of the pig-lead is got from the smelting of the collected fumes.

A knowledge of the geology—or, rather, the superposition—of the stratified measures is very essential to the mining agent. Which beds are usually productive—locally termed smitten beds—and which are generally barren is manifestly important to know. The local names and thickness of the measures which have actually been wrought in are as follow, beginning with and descending from the well-known Moor coal:—

	Average thickness Fms. ft.
Coal seam .....	0 2
Grits and shales .....	10 0
Crow lime and chert .....	6 0
Grit .....	6 0
Plate .....	4 0
Red bed lime .....	7 3
Bottle lime .....	1 3
Twelve fathom lime .....	12 0
Grit .....	4 0
Plate and girdles .....	12 0
Undersett lime and chert .....	3 4
Plate .....	4 0
Grit .....	4 0
Plate .....	2 2
Thin lime .....	2 0
Preston grit .....	7 0
Plate and grit .....	4 0
Fossil lime .....	10 0
Grit .....	0 4
Plate .....	9 0
Keld Heads lime .....	10 0
Plate and grit .....	8 0
Alternate beds .....	10 0
Ashbank lime .....	7 0
Alternate beds .....	13 0
Six fathom lime .....	8 0
Shales and limes .....	5 0
Ten fathom lime .....	12 0
Total .....	183 0

Generally speaking, all the lime beds are more or less productive—in fact, some have been very rich, together with the thicker grits, but the plates and alternate beds are usually unproductive, carrying, perhaps, only a trace of vein matter. Then, too, there is the "throw" of the vein; its influence must be considered. Some veins have a throw—i.e., vertical displacement of strata, varying from 50 ft. to a few inches, thus bringing beds directly opposite in composition against each other, which sometimes exert a prejudicial and at other times a congenial influence in the productiveness of the vein.

Perhaps the following cross-sectional sketch will illustrate the ordinary formation of the vein in many of the North of England lead mines, wherein A B might represent a shaft sunk in a vertical vein, having a throw of several feet, west side down:—



exploratory drifts cannot be located with that convenience, as is the usual practice, by being 10 fms. apart, but are driven to command the working of a particular bed or beds. A reference to the sketch will perhaps explain. The dotted line between the two sections would represent the top and bottom of a productive measure, *per transverse section*. The drifts are usually driven in the dead beds, not unfrequently carrying only a trace of ore, but the rises put up at proper intervals command the practical working of the vein, but success does not always attend such trials. Although certain measures may be very productive in one mine, a trial in another part may result only in disappointment. However, the productiveness of certain beds is evident when a measure 9 fms. in thickness has produced about 5800 tons of lead ore, of a gross value of something like 80,000/-

Much more might be said, especially on those leads which are constantly leaving and coming into the vein, alternately depreciating and increasing its ore value, but I have already trespassed too far on your valuable space.

C. R.

## MINING IN THE MARAZION DISTRICT.

SIR.—One of the most pleasing events that has occurred for many years was witnessed to-day at Goldsithney, to see a large steam-boiler drawn through the village by twelve very powerful horses from the foundry of Messrs. Harvey and Co., of Hayle, to Wheal Jewell Mine, situated between Goldsithney and Marazion. A vast number of people assembled on the occasion to witness the event. Mr. Geo. Laity, of Trevablyn Farm, was most eloquent in addressing the vast assembly, much to the delight of every one present, after which Mr. A. Bennett, one of the lords of the mine, who discovered Trenow Consols, the Wellington Mine, Alfred Consols, and Tolvadden—the latter mine is at present opposite Wheal Jewell. Mr. Bennett also discovered the Holywell and Greenfield Collieries in Wales, and the Halkin and Deep Level Mines in the Halkin Mountain, Flintshire, in the Principality of Wales.—*Marazion, Jan. 27.* ISAAC THOMAS.

## MINING IN ANGLESEA—THE MONA MINE.

SIR.—In accordance with your instructions, I have made very careful inspections and surveys of the underground workings, of the surface, and of the extensive works by which the various products of the Mona Mine, Anglesea, are made marketable—such as precipitating pits, furnaces, drying sheds, ochre sheds, ochre grinding mill, pumping and winding engines, with appurtenances, dressing sheds and arrangements, smelting works, shipping port, and various other necessities too numerous to mention. In submitting my report I must apologise for the length of time taken in completing it, but as I found the field so extensive I could neither do the property nor myself justice without a second visit—hence the delay.

This mineral property occupies the eastern portion of the hill known as Parys Mountain, which has for more than a century been celebrated as containing one of the largest deposits of copper ore ever discovered in the British Isles. This mine, although only divided from the well-known Parys Mine by a line determined by arbitration some years ago, has hitherto been little known to the mining world, owing to the fact that it has always been worked by private individuals, but it is remarkable that workings of so vast an extent, and metalliferous deposits of so important and interesting a nature, have not received greater attention at the hands of geologists and miners, for, with the exception of a short paper by Mr. T. F. Evans, H.M. Inspector of Mines, read before the Manchester Geological Society, and a work published in the German language in 1800, I have not been able to find any attempt at a description of the singular geological phenomena here displayed. The mountain consists of alternate channels of slate (locally termed shale), and hard felspathic and quartzose rocks, the latter being regarded as the lode in and near which the ore deposits occur. The general trending of these masses is east and west; two cross-courses intersect them at a distance of about 120 fms. apart, and appear to have had a powerful influence upon their contents and fertility. The lodes dip at varying angles, and may be estimated at an average width of 50 ft. The ore is found disseminated through the mass of the lode sometimes in small and insignificant strings, but occasionally in bunches of enormous size and great value, while rich deposits of the form known as *amas de contact* are frequently found occurring between the hard rock and the underlying shale, and in some instances penetrating the latter to a considerable depth.

The quantity of water pumped from the mine is comparatively small, but a remarkable feature in connection therewith is that it contains such a large amount of the sulphate of copper in solution as to render it a constant source of profit to the proprietors. The copper is extracted therefrom by the well-known process of precipitation by iron, which the water thus treated afterwards deposits a large quantity of so-called ochre, a commodity used largely in the manufacturing of colours as well as for purifying gas under the name of oxide of iron. These processes occupy a space of ground which I estimate at about 100 acres in extent, and many hundreds of tons of iron are annually employed in the extraction of the copper.

The sett now held by the Mona Mining Company comprehends about 430 acres, the greater part by far of which presents indications highly favourable to the existence of metalliferous deposits as yet untried, and stretches eastward from the boundary line a distance of rather over a mile. The company hold a fine farm of 150 acres, which, being situated within the sett and close to the mine office, is most convenient in enabling them to keep their draught horses within easy reach and call. Attached to the mine, but not under the same tenancy, is a small windmill erected and used for the purpose of levigating and grinding ochres and other minerals.

There is also a well-arranged and extensive smelting works at Amlwch Port, which is held by the company under a lease recently taken. These works communicate with the quay and harbour by means of an incline worked by a steam-engine. The quay and the surrounding warehouses are also held by the company, who do the discharging of vessels by means of a steam crane, and the opposite side of the harbour being the private property of one of the present mine company, who is disposed to facilitate as much as possible the extension of the concern, there will always be ample space for any further operations that it may at any future time be found advisable to prosecute.

It may give some idea of the extent and capabilities of these works by explaining that they have not only been equal to the requirements of the Mona Mine, but also the Parys Mines, during times of enormous yield, and have during such periods smelted the ores of other extensive mines in Great Britain. The mine is at present supplied with pumping and winding power equal to the depth now attained. There is a Cornish pumping-engine of 24-in. cylinder, with pitwork complete, which drains the mine, or at least the eastern portion, in an efficient manner. There is a 16-in. winding engine which draws from three main shafts by means of a vertical drum, and a pumping-engine which, as a novelty, reflects great credit upon the proprietors of the mine: it is a windmill of great power, recently erected with pitwork complete; it drains the mine at this part (west end) effectively to the 80 below the adit. There is another engine known as the Carreg-y-doll, which has become idle owing to the substitution of the windmill; in addition to this there is a small steam-engine used for drawing from a shaft, and for boring the timbers used for pumps as a substitute for iron, which in any form would be at once attacked by water so highly charged with copper, and shortly become useless. A water-wheel situated at the foot of the hill pumps up water for the use of the engines, an admirable arrangement, seeing that all the waters of the mines are so highly impregnated with acid, and, therefore, not fit for use in the boilers.

In going underground I was struck with an uncommon occurrence. I found at the 55 a well-appointed smithy, with all the requisites for sharpening the men's tools, thus saving them all the labour of carrying their borers to the surface; this I find has been in operation for some years, and is regarded by the miners as a great boon. The offices on the surface are carpenters' shops, smithies, dressing sheds, with the requisite appliances for dressing ores, drying precipitate and ochres, and all the usual appurtenances of an extensive mine.

As regards the mode of dressing practised there is very little to be described; it is exceedingly primitive, but after paying very careful attention to the attendant conditions, I must confess myself satisfied that it is probably the best that could be adopted; it is cheap, suited to the nature of the ore, thus saving much waste, and when it is borne in mind that the smelting works are at hand, and that at once by a

cheap process the ores and precipitates of the mine are reduced to a regulus of more than 50 per cent. produce, it will be readily seen that any expensive mechanical treatment of the ores would be attended with a superfluous outlay. As previously remarked, the waters of this mine are a never-failing source of profit, and owing to the importance of this department of the concern, I have thought it incumbent upon me to make enquiries as to the probability of their continuance in their present state. They have, I find, been richer in former times than they are at present, and a few years ago there was a considerable falling off in the quantity of fine copper obtained from this source; but latterly, since the opening out of certain parts of the mine by recent drivings hereafter to be referred to, the produce of copper precipitate has materially increased. I have every reason to believe that this source of revenue will continue for an indefinite period, and that the returns of precipitated copper and ochre will be maintained, or perhaps increased, as long as mining operations are conducted in the southern portions of the mine.

Having so far described the mine and its general belongings, I address myself to the special instructions conveyed by your letter of Jan. 13:—

QUESTION 1 AND 2.—The products and minerals are as follows:—Underground: Copper ore, iron pyrites, blue stone.—Surface: Copper precipitate, ochres, natural, precipitated and prepared, bog ochre used for purifying gas, purple slime, tin solder.

QUESTION 3.—Report and Inspection of Workings: I have made an extensive examination of the underground workings, and after having visited the more important points I have much pleasure in reporting to you as follows:—I cannot undertake adequately to give you an idea of the enormous quantities of ore which must from time to time have been extracted from the western and chiefly wrought portions of this mine. The great open excavations are in themselves sufficient evidence of the riches they have furnished, and observing this I devoted my attention principally to the question of their continuance in depth and in an easterly direction, where there remains three quarters of a mile upon the cupriferous channels of ground still comparatively unexplored. With this end in view I accompanied the agent of the mine, a most intelligent man, and thoroughly up to his work, to the 55, a point considerably under any workings hitherto prosecuted, and immediately underlying the former great open-cast workings, known as the Hillside open-cast, a continuation of the great ore runs which have been worked open in both mines. Here I saw a splendid course of copper ore opened at three points for a length of about 20 fms., looking well at both ends, and which I valued at 6 tons per cubic fathom of ore of from 6 to 7 per cent. This I know you will consider important when I say that the eastern fore-breast faces three quarters of a mile of virgin ground, and the same level would come considerably under the workings at the western boundary, thus furnishing backs of 100 fms. long in this direction.

In my mind the evidence is conclusive that the enormous richness of this great copper channel, which appearances so clearly indicate at the open-casts and in the old workings, continues eastward to a great distance westward, at any rate as far as the great cross-course, which separates the two mines, and downwards to a depth far greater than hitherto attained—in fact, what I saw perfectly convinces me that there is here a great and lasting mine. The surface examination also convinces me that cross-cuts driven both north and south would probably lay bare valuable ore channels on both sides of the great masses already discovered. There are ample evidences that the ore deposits already partially wrought are accompanied by many parallel ones of probably equal value.

As regards the workings in which the blue stone is raised, I regret to say that owing to the temporary conditions of the footways I was unable to make the exhaustive examination I intended, but from what I did see I am fully convinced that a supply which may perhaps be correctly termed unlimited may be obtained. The present raisings are 200 tons per month, and are obtained entirely from shallow holes on the back of the lode. The analysis of the blue stone now raised makes as follows:—Zinc, 39½; lead, 12½; and 11½ ozs. of silver to the ton of ore.

QUESTION 4.—With regard to the further development of this property I would recommend as follows:—I. That Sydney shaft should be sunk so as to cut at a greater depth the ore ground now discovered at the 55. This would not only be the means of opening out the ground in a miner-like manner, but facilitate the transport of the stuff from the different bargains. It may also be made the centre point for exploratory operations by means of the rock-drills. I would advise the erection of an engine of at least equal power to the windmill, and near to the same shaft, as an auxiliary in times of calm. Such an arrangement would meet the requirements of any possible contingencies arising on the course of a thorough development of this extensive mineral property. I would also advise that trial shafts be put down on the course of the mineral ranges south and east of the present workings. I am not at present prepared to determine their exact sites, as this could only be done by a very careful examination of the whole of the ground. I would suggest that the shafts to the north, in the eastern part of the mountain, should be sunk to a far greater depth. The deepest is now only 30 fms.; and observing that large quantities of ore have been raised above their present bottoms, I am strongly of opinion that a fine run of metalliferous ground is lying idle in this part of the mine. Referring to the shallow workings lying to the north in the easternmost portion of the sett which has hitherto been wrought, I would observe that the deepest shafts, with two exceptions, have been sunk to the depth of 30 fms. only: some are only 20 fms. deep. I have not been able to visit these portions of the mine, owing to the absence of footways, but I am assured that the levels and shafts will be found in almost perfect condition, and I have also been furnished with ample evidence of their former productiveness.

The drawing marked A represents one section of the ground under notice. It will be seen that Tiddy's shaft cuts a lode, supposed to be Charlotte's lode, at the 10, and another lode or branch at the bottom (the 30), while cross-cut driven south 10 fms. at the same level intersects the Carreg-y-doll lode. The Golden Venture shafts cuts a lode, to which it gives its name, a little above the 20, and the Blue-stone shaft cuts two branches, which unite at the 20, forming an enormous mass of ore, which was intersected by a cross-cut driven north at the 30, and thence worked upward to a considerable extent for copper, iron pyrites, and bluestone. As will be seen by a reference to the sections taken together these lodes naturally separate themselves into two distinct series—those whose trending leads them to the great masses wrought in the neighbourhood of the open-casts, and those which occupy the northern portion of the mountain. The former have already been commented on, and will be treated of again as I proceed. With respect to the latter I have to report to you that, according to reliable evidence obtained upon the spot, these workings were carried on profitably until a very short time before their stoppage. Tributaries followed the ore in many places by sumps sunk below the bottom level, but were forced to abandon them by the rising of water, which had to be drawn up by barrels worked by hand turn-trees.

According to testimony to which I believe thorough credence is due a quantity of not less than from 200 to 300 tons per month was raised in this part of the mine for a considerable period, and I am told that many old tributaries still speak with regret of the abandonment of those workings, which they represent as being situated in one of the most valuable ore-bearing portions within the sett. The ore here was on an average equal in richness to that of the more southerly portions of the mine, and made its due share of the profits of the concern. After a careful study of the point I am of opinion that the quantity gotten here in former years may be greatly exceeded by proper development, and I am confirmed in this by others whose knowledge of the ground renders their opinion of value. As to this part of the mine I would specially recommend the sinking of Lemins, Beirs, and Tiddy's shafts, and the opening out of the lodes they intersect as they proceed downwards. Unless some great and unexpected change occurs this must lead to very large returns of ore; cross-cutting both north and south will, of course, be advisable.

I would now beg to call your attention to that part of the mine which is illustrated by the section marked B, and have here to remark that a disturbance, apparently occasioned by the great cross-course previously referred to as lying between the Mona and Parys Mines, has exercised a great and important influence on the direc-

tion of the metalliferous channels of ground, which in this neighbourhood have proved the most productive measures of Parys Mountain. The so-called lodes here make a sudden and considerable bend to the north, so that they are thus lengthened to a very great extent on the Mona Mineside of the boundary line. This has had the effect of bringing into the Mona Mine a larger share of the productive ground than mere superficial examination of the surface boundary would lead one to expect. It thus happens that probably a very large proportion of the runs of ore which returned such immense quantities from the great open-cast in former times will be found in depth at some distance north in the Mona Mine. In sinking the Cairn shaft the present company have done much to solve the problem here involved. A reference to section B shows that Cairn's shaft about the 44 fm. level cut a bed of ore ground, which continued almost without interruption to the 80 fm. level, its present deepest point, and, although it is not indicated by the section that the ore reaches a greater depth, there is no reason, from all I can learn, to suppose that anything like the limits of the deposit has been reached downwards. The existence of this enormous mass at this point appears to prove conclusively that the great open-cast deposits have been discovered here in depth, and seeing that this is apparently one and the same thing with the great mass recently discovered south of Sydney shaft, and previously referred to, we ought to find here a continuous cupriferous channel extending over a length of probably 100 fms. of ground.

The present company since this discovery have raised some thousands of tons of ore from the immediate neighbourhood of this shaft (Sydney), and would probably have continued to do so up to the present date but for an untoward event which occurred a few years ago. According to the books laid before me at the office an average quantity of from 300 to 400 tons per month was raised here until the Carreg-y-doll engine broke down, causing the flooding of the lower levels, when the raisings fell off first to about 250 tons per month, then to 180 tons, and subsequently to nil, as the water rose.

The company having in view the high price of coal ruling at the time, and the greatly depressed state of the copper market, then constructed a huge windmill for the purpose of draining this part of the mine—a piece of mechanism which works well, and saves a large expense in fuel, but, as intimated before, I think it should be furnished with a little auxiliary steam-power. This trifling arrangement effected, I see nothing to prevent the resumption of large raisings through this shaft. The sinking of this shaft to a much greater depth than its present bottom, and the driving of levels in all directions, would almost to a certainty develop extensive ranges of highly productive ground. It is, in fact, a continuation apparently in its original form and strength of the great mass of ore which made this mine famous in former times. It appears to me to argue well for the future of the mine at all points in its extensive area that this, the principal mass of ore ground, shows no signs of falling off at the depth attained.

The accompanying sections are only a few out of a great many which might be given as showing an ample field for the employment of capital in exploratory operations, which indications and appearances fully justify.

At the mouth of an adit level driven many years ago by both mines through the cross-course separating them there is a series of pits for the precipitation of copper and ochre, worked jointly by the Mona and Parys Mines Companies. These are a small source of annual profit. In former times I find that large quantities of copper were obtained by burning the peat which lies in the Mona Mine sett far to the south of the present workings. To what extent this product may become again available I am not prepared to say, but it seems to indicate the existence in this quarter of ores not yet discovered.

It is worthy of particular notice that about 300 fms. to the east of the present operations there are shafts and workings which date originally from a very ancient period—I am told from the earlier part of the 17th century, and which have been wrought from time to time at more recent periods. Quantities of ore were raised here about 40 years ago, and even so recently as about 17 years ago ore much richer than the average of the mines was raised here, but the place being heavily watered, and there being no other means than horse-whims for drawing, it was I am told reluctantly abandoned by the agents. Further east again, and yet within the sett, there are traces of very ancient mining reaching almost to the road, which forms the eastern boundary. They appear to have been mere surface workings made at so remote a period that even tradition does not furnish a clue to the results obtained.

As a matter having an important bearing upon the future of this mine, I would beg to draw your careful attention to the fact that in the adjoining Parys Mine a lode lying far to the north of anything as yet developed in the Mona Mine, and known as the North Discovery Lode (see plan), has during the last 30 years produced profits amounting to some hundreds of thousands sterling. Whether the Mona Mine Company have as yet struck this lode among the several they have cut in driving north is doubtful, as they have not driven east and west to a sufficient extent to prove the question, but as the northern slope of the mountains exhibits fine backs and promising indications made at so remote a period that even tradition does not furnish a clue to the results obtained.

In conclusion, I have to observe that the statements herein made and the opinions I have expressed are the result of careful examination and thought, and I would add the conviction has been forced upon my mind that the quantity of ore that may be returned will for a very long period depend only on the price of ore and the amount of exploratory work done.

ABSALOM FRANCIS, C.E.

Wrexham

## BWLCHE UNITED MINES.

SIR,—Notwithstanding the cunning of the "Fox" and the keen sight of the "Lynx," with your kind permission I will make a few remarks regarding the pertinency of their observations to Bwlch United Mines. Why their letters about "tack-notes" should have been tacked on to Bwlch is best known to themselves. Certainly "tack-notes" have nothing to do with Bwlch, and I fail to perceive the relevancy of the association. Can it be the old story of the "Fox and the Grapes"? A short time ago a fall of fully 16 per cent was registered on paper, being equal to the capital of the company. Such a fall never took place in reality. I tried to buy them at the time, and utterly failed to meet with any below the full quotation. The fact is the price quoted for mining shares, under certain well understood conditions, is not an index of their true value, but rather one of the straits to which some dealers in them have been reduced through having oversold, and they adopt this means to save themselves from loss. Too often successful, success is not invariable. As I have pointed out on previous occasion the shares in this company are firmly held as a permanent investment by gentlemen who have taken the trouble to satisfy themselves once for all of its solidity, and now contentedly wait the fruits of their discernment and decision.

The damage done to mining by any system of "tack-notes" is in my opinion altogether infinitesimal in comparison with the mischief worked by the gentlemen figuratively emanating from the regions of frigidity. How many mines in Cardiganshire alone are inactive to-day from this one cause? and how many more are lying idle because the bulk of the capital was absorbed by promoters? Why the system is so rampant that the word "promoter" has acquired an additional meaning. This is the baneful system that presses hard upon the poor miner as well as upon the enterprising capitalist, and deprives both of their just reward. Referring to promotion money none whatever was paid for the Bwlch United Mines: 10,000*l.* went to purchase the mine, on which 60,000*l.* had formerly been expended for opening it out, machinery, buildings, &c. The remaining 10,000*l.* has been and is being employed to work it. The present frost (which may give any day) can only retard the sinking of the shaft from the 102 fm. level to the 120 fm. level by its own duration. The operations in the other levels are steadily progressing, and will soon be accelerated by the rock-drills.

It is to be hoped by all well-wishers of mining in Cardiganshire and also in the interest of the "poor miners," that more mines may be brought out under such business-like management: then we shall

hear less of "tack-notes" and the poverty of the workmen, capitalist and miner rejoicing together.

## SHAREHOLDER.

## MINING IN CARDIGANSHIRE.

SIR.—The wealth of this county in minerals is universally admitted, and it is an aphorism that what has been got is with practical working to get again. Few of its mines have been worked to any depth; for instance, the Lisburn Mines about 130 fms., returns given as 2,000,000*l.*; East Darren under adit about 116 fms., returns given as 1,000,000*l.*; South Darren about 100 fms., returns given as 130,000*l.*; Goginan about 190 fms., returns given as 1,000,000*l.*; Bwlch United sett about 90 fms., returns given as 250,000*l.* Many other undoubtedly good properties only require capital judiciously applied to make them dividend mines.

There are many rich prizes awaiting the exercise of energy. All that is necessary is a union of interests, and the elimination of any animosity or jealousy. Even in America we see that tunnels are driven for the mutual benefit of certain mines under different sets or holdings, each bearing its quota of the expense. I have been many times in the above county, and have had occasion to visit its mining districts. Proceeding from Aberystwith, on the left we have the West Goginan, and soon arrive at Goginan. Hard by is the Goginan Mine, which lies at the foot of a mountain, the adit of which is called the 120 fm level, giving the workings a depth of still 70 fms. This adit level comes to the boundary of the Bwlch United sett. The contiguity of the two mines cannot be better described than by cutting an orange in two. At Bwlch a fine lode has been cut at the 100, and the work is being vigorously prosecuted under the able management of Capt. Nicholas Bray. This lode is 20 fms. above the Goginan adit, from which mine large returns have been made. It would be a great feature if some arrangement were made to continue the adit under the Bwlch sett. It would undoubtedly add to the value of both, the richness of one would reflect upon the other, and as the mineral is rich in silver it is impossible to foretell to what value the shares in Bwlch would attain, since the lode can be followed up from the valley through each property, and there is little doubt it is the champion lode of the county. Near these two mines lie the East Darren, South Darren, Cwm Erfin, &c. These mines may be said to be on the silver range. Passing on we come to the lead mines, such as the Powell, Cwm Brwyno, Clara, Bryn Glas, &c., and further on the innumerable mines in the valley of the Rhedol; then to Frongoch, Grogwinion, and eastward to the Llwyn-ma-Lees. This mine is three miles from the Lisburn; its extent is 500 acres. It is on the Glog Fach or Lisburn Mines lode, and is now about 60 fms. in depth. A large amount has been expended on the property, which at a small present outlay would soon yield dividends. It is in the richest silver-lead district, and I have no doubt ere long it will be, as it ought to be brought prominently before the investing public.

Every mineowner has the right to bring his property conspicuously before the investing public. It would not be just if it were not so. What the investors should look to is to see that the money subscribed goes to the development of the property. Travelling facilities are now great, and at a trifling expense many able engineers are willing to give the investing public the benefit of their knowledge and experience, independent of any company. I trust that with the advancing price of lead, and the returning prosperity of the country, we may soon see capital flowing into Cardiganshire.

## ESPERANCE.

## MINING IN CARDIGANSHIRE.

SIR.—I think it is agreed on all sides that the best policy in mining is for each and all to promote its interests, and to infuse into it a healthy tone. No one, I am persuaded, would refuse to the worker who spends his time searching for the lodes at surface his due; he is entitled to what he can make, and the purchaser will, in his own interest, do the best for himself. Your correspondent "Fox" infers that the letter signed "Lynx" was written for a specific object—that of calling attention to the Bwlch United Mines. I for my part do not see the gist of this, since nothing is said to call for any or such special remarks. As promised by your correspondent, he will this week again give us the benefit of his views. Your correspondent, however, gives his own version how mines are bought; at the same time he prominently gives the name of the above property, the capital of which is also 20,000*l.* I think it would be as well to quote his own words—"Mines are bought (say) for 1000*l.*, machinery and all, and reappear in the London market with a capital of 20,000*l.*, hardly a penny of this being reserved for working capital." This is, however, not applicable to Bwlch, the working capital of which is 10,000*l.*, without any deductions whatever, since there are no promotion or other expenses; and as for the mine and its machinery 10,000*l.* shares were given. The landlords naturally want their properties worked to get their royalty or dues, and they have the simple remedy of putting necessary restrictions when the lease is granted. When a mine is bought the money has to be obtained for its development. The buyer who pays his 1000*l.* or more takes the risk, and is just as much entitled to compensation as the miner, who it is said spends so much time in using his indefatigable industry. As a simile, a wholesale house does not purchase a parcel of goods to lose by them. A profit has to be made to cover not only cost and labour but time and energy, so the party who takes all the risk is fully entitled to his profit. Men have got judgment if they cannot rely upon it, or employ the comitable means of ascertaining the *bona fide* of an undertaking it is their own fault, and no one is to blame but themselves.

We have heard much about the mineral wealth of Cardiganshire and its capabilities. The past, however, gives nothing to the present but hope. What is wanted by the miner is for capitalists to be attracted. By this means they will be amply repaid; it is, therefore, to their interest to protect those who wish to give them labour and the means to enjoy it. Let anyone walk to Bwlch from the village of Goginan. Nature herself will assert her rights, and show that everything is to be gained by its present workers, who are using the means to make the property what in my humble opinion it will be—a lasting dividend mine; and in the words of the manager I repeat that the probabilities of success in depth on a moderate outlay are as good as any mining property in Cardiganshire.

## TRAVELLER.

## MINING IN CARDIGANSHIRE.

SIR.—In last week's Journal I find a letter by one who subscribes himself "Lynx," in which he attributes the partial unsuccessful state of mining in the county, and the alienation of speculators, to the fact that landowners grant tack-notes to persons without means to work properties themselves, their chief aim being to obtain money by hawking the same.

While I do not doubt the sincerity of "Lynx," and admit that there is a great deal of mismanagement in connection with mining, I believe that he has not touched on the real cause of the evil which has proved so disastrous to many mining properties. Were landowners to act on his suggestion—to exclude the poor enterprising miner from making use of his knowledge, experience, and labour—mining would be deprived of the only factor in bringing to light wealth which Providence has stored in the dark crevices of the earth. The reapers would be called upon to reap while the husbandman had been prohibited from sowing.

It is true that they have no capital, but time, experience, and local knowledge of the different lodes, which is too often ignored, they have. In a hundred different ways their penetrating eyes have discovered traces of a lode crossing the country; perhaps by the roadside, or crossing a brook, or the ploughshare may have turned a lode stone to surface. These may appear insignificant to some, but they have led to the discovery of some of the best paying mines in the country. Strangers introduced as managers, whose chief qualification often being ability to write flourishing reports to deceive the shareholders, cannot be expected to have such a thorough knowledge of the direction of the different lodes, their probable intersections and junctions, as those who have spent their whole lives in the neighbourhood, and have taken an active interest in mining. Yet while stating this far be it from me to withhold any praise due to those few intelligent miners who have come amongst us, such as the long departed Mr. Matthew Francis, whose name is a household word in every miner's house in the county.

As far as my experience goes I do not know of any successful mine in this nor the neighbouring county which does not owe its beginning to the enterprise of a few poor miners, who making good use of their knowledge and experience, and working during their spare hours, have done work equal to a small capital, and in most cases to a much better advantage than a large one in the hands of an inexperienced man. Take, for instance, Level Yawr, worked for many years at an enormous profit by Messrs. John Taylor and Co.; Bronfloyd, that ought to have paid a good dividend at one time to the shareholders; Myndd Gorddu, which promises to be one of the best mines in the country; The Van, and West Van. All these owe their beginning to poor working miners; and I believe that the greater the facility given to them to search for lead the better it will be for the mining world.

There are some mining properties which are beyond the reach of the common miner. One in particular I know of, having one of the master lodes of the county traversing it, and which has proved very productive both east and west of the property, but on account of the difficulty in obtaining the same the poor miner has been prohibited from touching it, and its mineral wealth is kept both secret and sacred for future generations, unless some gentlemen will undertake to obtain the same, to whom I would willingly give every information concerning it.

I have before met with gentlemen holding the same theory as "Lynx," and having induced others to join them they took a tack-note of the whole country in this neighbourhood, and after making several attempts to cut the lode they miserably failed to do so in any new point. Indeed, so profoundly ignorant were they of its bearing that when driving to intersect it they drove in the opposite direction, and after spending a few hundreds in fruitless attempts they left the property to better hands, I hope.

The real cause of the evil of which "Lynx" complains lies somewhere in the process of transferring the mine from the hands of the miners to those of the shareholders. These intermediate agents and their allies are they who make the best harvest out of mining. If half the capitals assumedly raised for working mines were to find their way into Wales, mines this day would be in a more flourishing condition.

NATHAN HUGO.

## GOLD IN WALES.

SIR.—I have for some weeks past been searching in the *Mining Journal* files and elsewhere for the necessary data to complete a return of the gold obtained in Wales since the original discovery there of that metal by the late Mr. Arthur Dean about 1814, but as I have not been nearly so successful as I could have desired I should be very glad if some correspondent would supply the details for publication in your columns. I should like to see the names of the mines shown, and their gold production for (say) each quinquennial period, commencing with 1845. I am no believer in Mr. Readwin's gold growth, which is really nothing more than the exposure of additional gold filaments by the decomposition of the pyrites which occurs in connection with the precious metal, but I do think he is the best man to tell us what has been done in the way of production by the Welsh gold mines.

I have found a growing disposition to give the Welsh gold mines another trial, although so much money has been lost in them, and am, therefore, most anxious that full statistics and all other necessary details should be before the public, in order that success may be assured. We must have none of the chemical comicalities revived, whether in the direction of making the gold grow in the Readwin fashion, or in the direction of attempting to extract gold from pure oxide of iron in the Squires fashion, but we must have a little common sense, a fair amount of capital, and a large quantity of energy, judgement, and economy, and then gold mining in Wales will take its place among the most important industries of the country.

Taking the average of the Welsh gold lodes, or gold-bearing lodes to be more accurate, they are as rich as those of the Clunes or the St. John del Rey, both of which return good profits, and they are not more irregular than the gold deposits of the Richmond mines, which are certainly among the most prosperous and promising at present being worked. But the auriferous lodes of Wales must be wrought in the same way as the deposits of Clunes, Morro Velho, and Eureka—large operations must be carried on, so that there must always be plenty of pay rock in stock to go on with whilst the lodes are without metal; it must be the quantity rather than the quality of the mineral handled that must be made to pay profits.

Now that the miner has the advantage of air-compressors and rock-drills, dynamite, and the various other time and labour saving machinery and materials which were unknown when Arthur Dean made his discovery, there is no reason why Welsh gold mining should not be made highly remunerative, and if capitalists neglect their present opportunity they will only have themselves to blame for losing profits which they might secure.

R. W.

Tue Brook, Jan. 27.

## A WORD TO INVESTORS IN MINES.

SIR.—Knowing that your valuable Journal is much used by investors in mines as well as speculators, allow me as one of the former to say a few words to my fellow-investors. At the present time it is needful for us to be cautious, for as a rule investors as a body are not the wealthy among mine share buyers, and find that it is very difficult to get the same price for their shares when they want to sell as when they bought before the speculators had their run. A few points want to be borne in mind ere the investor runs off to buy. He must not look only at the prices of the shares, but at the prices and relative values. For instance, as of late, when Killifreth is named in comparison with South Caradon it is to be borne in mind that while Killifreth has 6000 shares South Caradon has only 512, or (say) one-twelfth the number, besides being a settled dividend property. Again, because Crebor has turned out well we have Crebors of all the points of the compass, without any regard to the run of the lode or the nature of the strata. I notice that while Crebors are at (say) 10 one of its new namesakes, of seven times its number of shares, are quoted at 2*l.*, and recommended as cheap. At the same time, Crebor has over 4*l.* per share spent in its development, and making good profits, while the other has not yet spent 10*l.* towards this object. Again, I notice Parys are much pushed up. Well, I have nothing to say against it, only look at the number of shares. For instance, last week a very nice dividend was paid on South Darren, but had South Darren five times the number of shares what would the value of the dividend per share have been? Another, West Kitty, may be a good mine, and when compared to Wheal Kitty it should be remembered that West Kitty has 6000 shares, 2*s.* paid, while Wheal Kitty has only 4000, worth 5*l.* 4*s.* 6*d.* per share, spent in the development of the mine. Another point to be taken notice of is the run of the lodes and the character, &c., of the strata, as it is often the case as with Crebor, when one mine turns out well up crop many with the same name tacked on to some addition. For instance, the various Vans, Chivertons, and others, of whom we may ask "Where are they?" All gone except (say) East Van and East Chiverton, and the cause is easily explained. All, with the exception of the two named, had no right to take the name they adopted, being in a different run of ground altogether, whereas East Van and East Chiverton are not only east of their celebrated namesakes, but on the very identical run of ground, and when the lode is fairly got down to will, no doubt, prove themselves worthy of their names. The only thing against East Van is the great number of shares—it takes a heavy profit to pay a fair dividend on 18,000 shares. I have said enough to put investors on their guard about shares much puffed up and run to a great price. Do not follow them, pick up shares in well-situated, well-managed mines, that have been silent for years past doing the work of opening out their ground. Avoid for investment (whatever you may do for speculation) mines of a mushroom-like growth, springing into existence in a day, and imposing on the market because of their good company. A mine may be near a good mine and yet be in a non-productive zone, even if on the same lode, all these points want to be looked at before the investor puts money in mines. If he does so he may hope to reap the large profits of successful mining investment.

J. B.

N.B.—Since writing the above I have heard that East Chiverton has just cut the lode in the 90, and it is a much more profitable look-

ing lode than the 70 was over the same point, containing lumps of lead, whereas the 70 made no lead there, yet valued 2*l.* tons in the end.

## SOUND INVESTMENT—LONDON STEAMBOAT COMPANY.

SIR.—If you will allow me the space in your reliable Journal I would desire to direct the attention of your readers to a sound investment that offers a good opportunity—the London Steamboat Company—whose shares at present stand at about 6*l.* It is now on lease to Mr. Lever for 21 years, at a rent of 10 per cent. on the share capital. The enormous traffic carried on by the company is still increasing every year. The shares are honestly worth 8*l.* each, and even if they should rise to 10*l.* they will then be returning the investor a steady 5 per cent. on this price.

There is also another class of investment deserving prompt attention—the most secure of the iron and coal companies, whose shares are steadily and surely advancing in value. Of these the Rhymney Iron Company (Limited) and the Ebbw Vale Iron, Steel, and Coal Company (Limited) offer particularly favourably for investment. Through the recent depression each maintained a good balance in hand. With the fast accumulating orders from all parts their products this year will be simply enormous. The Rhymney Iron Company, in order to keep pace with the rapidly increasing demands, are now issuing some 7 per cent. debentures, redeemable in 10 years, in order to increase their capital; but their 50*l.* shares (fully paid), at their present still low price, offer a far better investment. Altogether the prospects of these companies were never better. With regard to sound investments in mines, none appear more favourably than Panulcillo (Limited) and Copiapo (Limited), which, with their accumulations, are honestly worth 10*l.* and 25*l.* each respectively, which prices it will not be long before they reach to.

VERITAS.

## Meetings of Public Companies.

## DEVON GREAT CONSOLS.

An extraordinary general meeting of shareholders was held at the office, Austin Friars, on Wednesday—Mr. PETER WATSON, Chairman and Managing Director, in the chair—"For the purpose of nominating two trustees in the places of Mr. W. A. Thomas, deceased, and Mr. T. Morris, who has no wish to remain longer in the position as the other trustee."

The notice calling the meeting was read by Mr. W. H. ALLEN, the secretary.

The CHAIRMAN said the notice convening the meeting and the accompanying circular informed the shareholders that they were met to nominate two trustees. One of the last trustees—Mr. Thomas—had been Chairman of the company since 1844, when the company was started, and also one of the trustees. In accordance with the Articles of Association it was the duty of shareholders to appoint new trustees in case of death or resignation of the existing trustees. The best resident director, Mr. Morris, who had also been a trustee almost from the commencement, had consented to retire, and therefore the shareholders had met to day to appoint two gentlemen to fill the vacancies thus caused. It was a matter entirely in the hands of the shareholders, and he would sit down to receive the nomination of any two gentlemen.

As no shareholder rose to propose any gentlemen as trustees, Mr. STANLEY said that he himself and Mr. Stanley Morris would be willing to act as trustees if it met the wish of the shareholders.

Mr. STANLEY: I have great pleasure in proposing that Mr. Peter Watson and Mr. Stanley Morris be appointed our trustees. We know that these trustees are never very profitable to those taking them, and they incur great responsibility, and we are under great obligation to gentlemen who are properly qualified and are ready to become trustees. (Hear, hear.)—Mr. T. N. ROBERTS seconded the resolution, which was put and carried unanimously.

The CHAIRMAN said that concluded the business which they had met to transact. Mr. STANLEY said that, though the business of the meeting was over, perhaps the Chairman would give him permission to ask a few questions. He had received the circular of Jan. 10, stating that an arsenic contract of some magnitude and importance to the company had been concluded on that day. He did not wish the Chairman to give information which it was advisable not to give, but he thought it would be satisfactory to the shareholders to hear a little more relating to that contract. With regard to the price of copper, he asked how much more per ton they were getting now than 12 months ago, and he would also venture to ask the Chairman his opinion regarding the present condition of the copper trade? He also ventured to express the opinion that the company had not for some time past been getting a fair value for their copper, and much of that, in his opinion, rested on the fact that they were paid according to what was called the Cornish ticketing. He held in his hand a circular recently issued by the Cape Copper Company, in which reference was made to this mode of ticketing, and on page 5 it stated—"Circumstances have come to the knowledge of the directors which prove that the apparent competition has been little better than a farce," and a little further on it stated that this farce involved no less an amount than 20,000*l.* in the accounts of the company." He suggested whether it would not be prudent for this company to sell their ore at Swansea, or by private sales, and he asked the directors whether they were satisfied with the last few sales, and whether they did not think they ought to have a better value for the copper. He had not failed to notice that all the prognostications which had been made by the Chairman relative to the improvement in copper and the metal market generally had been fully verified; he should, therefore, like to ask the Chairman whether he thought the copper trade was still improving, and if so whether the company's sales were likely to be as large, or larger, than had yet taken place. In November last the Chairman also made the remark that when a marked improvement took place in the property it would be a prudent thing to forego one or two dividends, in order to provide sufficient boring apparatus and other similar purposes. As one of the largest shareholders, he thoroughly endorsed the view then taken by the Chairman, and no doubt his brother shareholders did the same; but circumstances had altered favourably since last meeting, and he should like to ask whether the shareholders were likely to have a dividend in May next? ("Hear, hear," and laughter.) At the same time, he did not press upon the board the giving of undue dividends, but he wanted to see the dividend gradual and permanent, and not a jerky one.

The CHAIRMAN: Jerky, up or down. (Laughter.) Mr. STANLEY said what he wanted was a permanent and reliable dividend, and to see the company made a permanent success. At the former meeting he spoke some words which might, perhaps, have smacked of severity upon some excellent men at the mine, but times had now changed, and he suggested that with the marked improvement in the property the time had arrived when they should give some little advance to some at the mine who, being industrious and persevering, were entitled to consideration, and to be made to feel that their labours were not forgotten and not unrewarded. A rumour had reached him that they were opening up the South Lode Mine, and important results were expected now the boring apparatus was supplied. He was very pleased with the exertions which the Chairman and board were making to bring the company again to a state of prosperity. The shareholders had waited patiently, and not entirely with a faint heart. He trusted a different state of things was now coming, and he also hoped they were working harmoniously at the mine. After the Chairman's reply he should be happy to move a cordial vote of thanks to that gentleman and the directors. (Hear, hear.)

A SHAREHOLDER also asked whether they might expect a dividend in May? The CHAIRMAN said that though the actual business of the meeting was over he should be happy to afford the shareholders all the information in their power. Mr. Stewart had asked some very proper questions, and another gentleman had asked with regard to a dividend. Referring to the last question first, the shareholders would remember that the hon. gentleman who had now asked the question tried very hard at the last meeting to get at the period when they would declare a dividend. At the last meeting, in November, one of the shareholders made this remark:—"There is one word upon page 8 of the directors' report which I should have liked to have seen stronger; the directors say they 'hope' to resume dividends—'Cannot that word be made stronger?' I answered, if you will remember, by saying—'I will put a double hope,' and there was a laugh, and then a shareholder quoted Pope's line—"Hope dwells eternal in the human breast," to which Lord Claude Hamilton added the next line—"Man never is, but always to be, blest," and then the resolution was put and carried. Mr. Stewart asked the price of copper now compared with what it was 12 months ago. In January last they got, on 875 tons, 12*s.* 1*m.* per ton; last week they sold 848 tons of similar quality, on which they got 2*l.* 12*s.* per ton, or 1*m.* more per ton on the 33*s.* Mr. Stewart had very properly remarked that they had not received so much on the last sale as was anticipated, and this was quite correct, for looking at the price of metal, the directors considered it worth at least 250*l.* or 350*l.* more.—Mr. STANLEY: That is it—quite correct.

The CHAIRMAN said that at the meeting of the agents and clerks of the mine last week (for they met once a week and talked over the affairs of the mine and interchanged ideas), they recorded their opinion that they were very much disappointed at the amount realised from the copper ticketing in the previous week, 22,000*l.*, and adding—"Looking at the copper market, we consider the sum should have been at least 250*l.* to 300*l.* more." (Hear, hear.) He also had a letter from Capt. Richards, in which he stated that he had attended the ticketing, and expressed his great dissatisfaction at the price given to this company for its ore at the ticketing. He might mention that the directors had received representations from several shareholders on the subject. He had seen the circular signed by Mr. Lever, the secretary of the Cape Copper Company, which put the case very clearly; and he might mention that the dissatisfaction of the Cape Copper Company in the prices had induced them to purchase smelting-works for themselves. (Hear, hear.) Certainly the Devon Great Consols Company had reason to complain of the price at which the smelters had been buying the ore, and the directors had brought the matter before them, and the reply was that at one time they had command of the copper trade, but such was not the case now. That might be so, but that was no reason why they should not bid up according to the price of copper; and it was the feeling in this and other companies that the shareholders should have fair play, and that when the ore was put up to ticketing a fair price should be obtained for it, and nothing short of that would content them. (Hear, hear.) The matter had been before the directors a great many

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times, and had again been under consideration. What he understood Mr. Stewart to wish was that a representation should be made to the smelters with respect to this important matter. (Cheers.) As regarded the copper trade, he stated at the meeting in November that all probability there would be a rise of 20/- per ton in the price of copper in the course of this year. From that time to the present it had gone up 10/- In August Chill bars were 52/-, and now 74/-, which was a rise of over 24/-, which gave this company 17s. rise, but he felt that they were entitled to at least 20s. per ton rise. They sold from 10,000 to 11,000 tons in the year, and a rise of 5/- per ton ought to give them at least 5s. per ton on the ore, which on the quantity he had named would give them about 2500/- extra profit on the year, or 25 per cent. extra dividend. With regard to the future, they had, as he had said, got the 10/- rise out of 20/-, and now he would go further, and express his belief that there was every probability they would have a further rise of 20/- per ton. That was his conviction with regard to the copper trade, and he would not say but what it might be a great deal more. (Cheers.) Mr. Stewart had called attention to the sentence in the Cape Copper circular, which stated that "circumstances had come to the knowledge of the directors which prove that the apparent competition was but little better than a farce." Well, that appeared to be the general feeling throughout the county, and he was sorry to say that he believed it was so. (Hear, hear.) They must endeavour to have fair play with the ticketing at Truro, or take some other means; he had seen some influential people on the subject, and unless there was fair play there would be an end in a very short time to the Cornish ticketing. The circular which he had issued referred to the arsenic contract. There had been several meetings on the subject, and at half-past three on Friday week the contracts were entered into and settled at the directors' table. Some secretaries and directors would take two or three days in getting out a circular, but knowing the importance of letting the shareholders know of the conclusion of the contract, he stayed at the office till seven, and did not leave till the circular had been printed and sent out to between 300 and 400 shareholders that night. (Cheers.) He wanted every shareholder to know what he knew himself as soon as possible. It was the largest contract the Devon Great Consols had ever made for that commodity, and he believed it would be one of the most profitable contracts, and that before the end of the year some of the proceeds would be in the pockets of the shareholders. As regarded this "jerky" question of the dividend, he himself was the largest shareholder, and no one was more hungry for dividends than he was, but up to the present the dividend had been better employed in the mine in the shape of boring apparatus, machinery, &c. The directors had had to buy a very heavy stock of materials—iron, steel, coal, timber, and various other materials. This was done six or seven months ago, in view of the rise which was then imminent in those articles, and he might mention if they had to buy them at the present time they would have had to give about 35 per cent. more for them, so there had been a saving to that extent to the company by the policy which the board had pursued. The sum of 1000/- had been spent on boring machinery, and the expenditure was still going on; the apparatus was started about a month ago, and in the first month, even with the imperfect handling of the men, who had not been accustomed to work boring machinery, they had been enabled to drive, in hard rock, at the rate of about 5 fms. per month, or nearly three times more rapidly than if the same work had been performed by hand labour. This would enable them ultimately to increase the returns of ores. These mines were the largest mines in the country, and in times gone by had been one of the most profitable, and might again stand, he would not say, at 80/- per share, but certainly in a much higher position than now. Having read a letter from Mr. Bawden and Capt. Richards at the mine, he went on to refer to the advances which had been made at the mine. He said the directors had given advances to the men who had been deserving, and should continue to do so when they thought it desirable. (Hear, hear.) In days of depression the men must bow to the directors, and in like manner when copper went up the directors would be always ready, as they hitherto had been, to do justice, but in doing that they must also take care to do adequate justice to the shareholders. Everything was going on at the mine most harmoniously, he believed, than ever before, and there was every desire on the part of the agents and all interested to push on operations with energy, and to give satisfaction to the shareholders of the company. The shareholders might rest assured that no stone would be left unturned to do this. Referring again to the dividend, he said he was not going to let the company be prejudiced by too early a declaration of a dividend, and what he desired was that when once a dividend was declared it should go on progressing, and not with jerks. A large shareholder had asked whether a dividend could be given in May of 5s. per share, and his reply was that he hoped it could, and perhaps long before. (Cheers.) He would even go so far as to say he hoped they could give one before May, and also one in May. (Cheers.) He believed that at the next board meeting the directors would take into consideration the desirability of dividing something amongst the shareholders, and he wished to express his belief not only to the shareholders present, but to those absent that the next meeting of shareholders of the Devon Great Consols Mining Company in May would prove to be one of the most satisfactory they had had for many years. (Cheers.) Some might ask what was the exact position. He was not going to commit himself, but he would give simple facts and figures. This was not a small mine but one of the most important mines in the kingdom. There was, it was true, only 1/- per share paid up, but if they went over the mines and put down what it had really cost, including machinery and everything, they would find it would amount to about a quarter of a million of money. The engines, water-wheel, pit-work, buildings, and one thing and another, represent an amount of 25/- per share, which had all been paid for out of the profit of former prosperous years; and therefore, when they talked about a premium, they must recollect what had been done. In 1853 the property was selling at about 32/- or 34/- a share, and what they hoped to do in comparison with that depended upon the price of copper. They gave 17,000/- in that year in dividends. He did not say they were going to do that this year; but, to repeat an expression which he had used at the last meeting, he would put a double hope to it. (Cheers.)

Mr. STEWART: We are very much obliged to you, Mr. Watson, for the very nice speech you have made, not only nice in substance but in the manner in which you have delivered it. I, therefore, move a cordial vote of thanks to the Chairman, and I do not think I shall find much difficulty in getting some one to second that. (Hear, hear.) I have had the greatest possible confidence in Mr. Watson ever since I have had the pleasure of knowing him, and I hesitate not to say that I regard him as a Solomon amongst the simpletons. (Laughter.) He has had the sagacity to see that there was a future in store for this company, and he has had the perseverance to carry through the enterprise with a firm and unflinching hand. (Cheers.) I believe the success of this company is closely associated with the name of Mr. Watson, and I hope the time is not far distant when we shall in a unanimous way give him some substantial evidence of our appreciation of his services. (Cheers.) —A SHAREHOLDER seconded the resolution, which was put and carried unanimously.

The CHAIRMAN acknowledged the compliment, and said the efforts of the board would be to place the company on a thoroughly permanent basis. Before sitting down he proposed a vote of condolence with Mrs. Thomas on the death of her husband.

The resolution was seconded by Mr. ROBERTS, and carried, and the meeting broke up.

#### GROGWINION LEAD MINING COMPANY.

The annual meeting of the shareholders was held, on Thursday, at the offices of the company, Change-alley, E.C.,

Mr. Ross in the chair.

The SECRETARY read the notice convening the meeting, and the report of the directors' was taken as read.

The CHAIRMAN: Gentlemen, since I last addressed you upon the subject of the affairs of this company the scene has very considerably changed. Last half-year it was my unfortunate duty to give you a very doleful tale, but, at the same time, I was able to point out many indications which seemed to foreshadow that a change for the better was approaching us. You will see by the accounts, if not by the report, that that forecast has been amply verified. I am not mentioning this to induce you to think that I have greater power of penetration than pertain to other people, but merely for the purpose of showing you that the grounds on which I based the hopes in which I then indulged, had something more than mere opinion for their basis. The rise in the value of lead ore, for example, up to the present time is as much as I then expected, but I am glad to believe that we are far from as yet having reached the highest point lead ore will shortly attain. The amount of profit we have earned during the last six months is derived from an average selling price of only 10/- 10s. 1d. per ton, whereas we are now getting 13/- and upwards—13/- being the price that English pig lead was selling for only a few months ago. Presuming that we get only so good a price as this—13/- per ton—and not an advanced price, as we have reason to expect, for the next six months I think I may very safely promise you that the profit will be more than double what it is for the present half-year. Of course there is a possibility to be taken into consideration that prices of labour and materials will to some extent rise, but I do not think for a moment that the rise will be more than a mere percentage upon the present quotations, and certainly it will not touch the fabulous rates that ruled in 1872-3. Now, although I am only anticipating 13/- a ton for lead, it is right you should know that the last 100 tons, sold a day or two since, fetched 13/- 4s. per ton, and it is quite possible that this time six months hence the price will be something like 16/- It is, therefore, perfectly clear that the profit we have made for the past six months can be no measure of the profit that will probably be made during the six months upon which we have just entered. Another point to which the directors desire to call your particular attention is the improvement in the average value of the yield of ore per fathom. In order that you may understand how we arrive at this value let me explain that we take the entire number of fathoms of ground that we go through in the course of the year, and then average our total yield over that number. Of course many fathoms of ground are perfectly barren of mineral, but when we come to average it, as it is our practice to do, it represents a very respectable yield. Other companies may probably show more, but let me tell you there are a good many companies that show very much less. While on the subject of sales it is just as well to remind you that at the last meeting I pointed out very clearly had you been contented to sell ore at the low prices then existing you would have paid all your costs and not shown a loss as you have done for the last 12 months. That opinion was in opposition to the views of many of the shareholders, but I venture to submit that the sequel has shown that I was right. However, the period of anxiety and depression through which we were then going has happily passed away, and so upon that difference of opinion no more need be said. I am always sorry to differ from the shareholders who favour me with their opinions, but some of these I am bound to say are based only upon theory, and others upon an imperfect acquaintance with the facts. It is impossible for me to reply to all the communications sent me, and this is the only way I can apologise for not doing so. The many years I have been the Chairman of this company have not been lost upon me in regard to the experience they have brought, and if the shareholders are willing that I should remain the Chairman of this company they must also allow me to exercise my own judgment on what I think best for our mutual interests. (Hear, hear.) Our purchase of the adjoining land, which has been before you at various times, is likely. Mr. Kitto tells me, to be of very great importance to us. You will remember that it extends from our old boundary considerably to the east, and it is to the east of our present deep level it is at the present moment the lode in immediate proximity to this new ground which is richer than it has been for years. Apart from this fact even there is another—that we are driving towards one of the richest

mines in Cardiganshire, and its lodes are underlying towards the ground that we have acquired. This matter will be alluded to again before the meeting closes. The proposal that we should set apart a portion of our future profits to pay for this purchase is a point upon which the directors feel very strongly, but of this we shall presently say more. Turning to the accounts, our expenditure on capital account during the six months has not been very large, and I believe that our machinery at the present time is about as perfect as any machinery can possibly be. (Hear, hear.) Our dressing apparatus, as I am given to understand a model of its kind, and is resort to by other mine managers with the view of complimenting us by copying it, and "imitation" it is said is the sincerest form of flattery. (Laughter.) As to the reserve fund we continue to add all the interest we receive to it, but doubtless this will be the subject of discussion in the room. The revenue account stands very much as it always has done; but the payments for labour, &c., appear to be much smaller here than they have been previously. That arises from the welcome fact that you now begin to see the effect of the reductions that we told you were being made. We shall get relatively the same amount of work done in the coming six months that we had done in the same months just expired, and for much less money. The royalty you will see stands at a much larger amount, inasmuch as we have sold more ore and at higher prices. On the creditor side of the account you will observe that we have discontinued the practice of taking broken ore into the account. (Hear, hear.) Individually I was always averse to valuing ore not absolutely sold. We have always a great many tons of broken and dressed ore lying on the mine, which in future we shall not bring into the account until such time as it is absolutely sold. The profit and loss account once more shows a profit, and next half-year, as I have already told you, I believe (although I again disclaim the prophetic instinct) that we shall be able to pay you a very respectable dividend. Mr. Kitto is unavoidably compelled to be absent to-day, but I think the report he has furnished is as satisfactory as a report can well be. (Hear, hear.) He gives you the entire number of fathoms of ground we have driven, and the accounts show you what the driving has cost. He further tells you that the mine is in a very satisfactory condition, and that undoubtedly means that our reserves are as plentiful as they have ever been, which opinion is confirmed by a statement in his (Mr. Kitto's) report, where he says that he believes that the present rate of the returns as a minimum can be continued for a long time to come; and as I have already told you, this continued output of 100 tons per month, at a higher price than we have been getting during the last six months, will result in very considerable profits. Some of the shareholders have asked me by letter when we intend to increase our returns. We shall be very glad to do so when the interests of the mine can be conserved thereby, but we prefer to leave that question to the good judgment of Mr. Kitto, and are quite satisfied that when he sees the way to do it he will have no hesitation about the matter. The present rate of profits will give us very good dividends, and I would rather see them continued for a great number of years than see increased profits last but for a shorter time. I dare say you may remember that some years ago, at one of these meetings, Mr. Kitto said he thought the mine would last the lifetime of most of the shareholders. Well, it has been returning ore for the period of 11 years that I have been connected with it, and I understand for 50 years prior to that, nor can I see the smallest reason to doubt but that it will continue to yield ore for a similar period yet to come. This may be a consolatory reflection to the shareholders, both present and absent. The mine, gentlemen, has a past history, but that its future history will eclipse that of the past I am certain as one can be of anything that has not yet come actually to pass. (Cheers.) He (the Chairman) concluded by moving the adoption of the report, and by inviting any comments that the shareholders might have to make. Although, he added, the meeting is not a large one, there are 174 shareholders present in person or by proxy.

Mr. OWEN seconded the motion.

Mr. DAVEY: Have you made any further sales since this balance-sheet was issued?—Mr. BEDFORD (secretary): One sale of 100 tons, at 13/- 4s.

Mr. DAVEY: Is that a higher price than the last?—Mr. BEDFORD: Yes; as you will see by looking at the various prices given in the report.

Mr. BROOKER, J.P.: The first sale was 8/- 4s., and the lowest we ever made.

A SHAREHOLDER: The last sale I suppose will leave a profit?—The CHAIRMAN: Yes; a fairly satisfactory profit.

Mr. DAVEY: Are you going to continue writing off your plant and machinery at the same rate as you have heretofore. I think you have now written 80 per cent. off?—The CHAIRMAN: We have written off a large amount, but opinions differ as to the advisability of writing off to the same extent as hitherto. If I may be permitted to express my own individual opinion it would be to recommend you to go on writing off at the same percentage. We are, however, quite ready to agree to any suggestion that may come from the opposite side of the table.—Mr. KILLINGSWORTH (auditor): We are making an additional outlay.

Mr. DAVEY: I suppose the plant and machinery are worth what you gave for them?—Mr. KILLINGSWORTH: Hardly so after five years' wear and tear.

The CHAIRMAN: As a going concern it is no doubt worth what it stands at in our books.

Mr. WATSON: If you still make additions is it not possible that it is as valuable now as when you purchased it?—The CHAIRMAN: No doubt.

Mr. DAVEY: I think 5 per cent. would be sufficient to write off, instead of 12% per cent. as now.

Mr. OWEN (director): I quite agree with you. The machinery is in excellent condition at the present time.

Mr. DAVEY: There is no doubt the machinery would fetch its full value if we wished to sell it. I should not care to see it reduced 10 per cent.

The CHAIRMAN: We will take that point into consideration to see if we can suggest something better between this and the next annual meeting.

Mr. DAVEY: I think that matter should be referred to the manager, who is the best man to deal with it.

The CHAIRMAN: Machinery is rather rising at the present time than retrogressing. We should be glad to have further comments on the report, for we count the fullest discussion.

Mr. DAVEY: It struck me that the purchase of additional land ought to go into the capital account.—Mr. KILLINGSWORTH: The resolution was that it should come out of the reserve fund.

Mr. DAVEY: Then when it is repeated to reserve fund what are you going to do with it?—Mr. KILLINGSWORTH: It will appear as one of the assets in your balance-sheet as a piece of land which cost 1500/- It will be an additional asset.

Mr. DAVEY: Considering that it is the most valuable part of the set I think we ought to take care to keep it well before us in our accounts. (Hear, hear.)

Mr. WATSON thought the matter of the 300/- to make up the reserve fund might well be postponed until next meeting.

The CHAIRMAN: The directors simply recommend it for 1881, and the question can be discussed then.

Mr. WATSON: Until the shareholders receive a dividend of 5 per cent. we should not provide for this sum. When the shareholders receive 5 per cent. again then look after the reserve fund.

Mr. KEELEY: I like the principle of establishing and maintaining a reserve fund and I do not think the question of dividend has anything to do with it. I think that in a mining company especially it is necessary that in order to be in a sound position it should have something to fall back upon in case of accident or in case a lot of deadwork has to be done when the capital is exhausted.

I think it is a question not of to be done when the capital is exhausted. I think it is a question not of prudence but of policy, and that some portion of the profits (if any are made), or if only small profits are realised, all of them should go to form a reserve fund to fall back upon in case of accident. We want a reserve fund without doubt. I think it is also necessary for the security and safety of the company that we should have a reserve fund, and if the profits would only pay a dividend of 1 per cent. instead of dividing that I would put it to a reserve fund. That is the principle I would advocate.—Mr. WATSON said he quite differed from this.

Mr. DAVEY was of opinion that the present shareholders should have some consideration. The reserve fund was a fund of future shareholders, and the present shareholders ought to have some advantage before it was augmented.

Hear, hear.

A SHAREHOLDER, As you have a reserve fund I think the shareholders have a prior claim.

Mr. BROOKES: My own belief is that not only will dividends be paid during the coming year, but that you will have a balance available for a reserve fund as well. (Cheers.)

The CHAIRMAN then rose to reply to the various points raised, and said: As to the reserve fund you will observe that the directors have adjourned the consideration of the subject for a year, but it is obvious from the course which the present discussion has taken that the shareholders object to any increase of the fund at present, because it may militate against their dividends. I think that is a mistaken assumption, however, because if you will attentively look at the profit and loss account for the last six months you will see that a very satisfactory profit has been made even upon the very low value that has ruled for lead, and it is a fair, and I think a correct, inference to suppose that if during the next six months we have a range of values no higher than that at which we have been selling ore, we should have a very considerable margin of profit, which will avail to pay the shareholders more than the 5 per cent. with which it seems the hon. proprietors will be contented. If he gets 5 per cent. he may be satisfied, but I tell him frankly that I shall not be satisfied if the shareholders do not get much more. I hope, for example, to receive something like double the amount mentioned, and if we do, and I cannot say we should be doing otherwise than cautious men of business would do, in putting aside a small proportion from our profits to reimburse a fund which I do not think any other lead mine can equal, and of which we are naturally very proud. More than that, we have every reason to know that it has stood us in very good stead at a time of panic, so that when the shares of other mines were tumbling about the ears of those persons who sold them ours were maintained high in public favour. This to a very large extent was due to the fact that we have a reserve fund equal to about 1/10th of our entire capital. I am bound to tell the proprietors that the directors would stand upon that paragraph in their report about the reserve fund, because they are so firmly persuaded that it is for the interests of the company, and I am sure that when the hon. proprietor meets us next year he will be glad to confess that 300/- is but a very small percentage to set aside out of our annual profits for the purpose of bringing up our reserve fund to such a figure as is represented in the accounts of no other similar company with which I am acquainted. The public know we have this reserve fund, and the fact is not unappreciated by them. As to what we ought to write off the plant, that will be taken into consideration between this and the next meeting. There is no doubt that the money we have expended for the additional land has been the wisest thing this company has done in recent times. It will be of great value to us, and every fathom we drive into it only confirms the accuracy of the original recommendation made by Mr. Kitto when he said it was of the greatest moment that it should be secured. Even yet we can scarcely form an adequate idea of the value that land will bring-by-be to us. I believe, gentlemen, there is a prospect opening up before us that far surpasses the sanguine expectations of any of the shareholders in this company. (Cheers.) I believe Mr. Kitto is cautiously keeping back the best half of his opinion, and I quite expect before we have been driving there for another year or two we shall discover something of which we have little knowledge now, and that the 1500/- taken from our reserve and expended in this way will by-and-by turn out to be of inestimable value to us. We think that the results of the half-year's working confidently justify us in promising you that we should during the next 12 months realise very satisfactory profits, and put us in our old position of being able to pay a dividend once more. We have simply for one twelve months been obliged to suspend dividends owing to the low price of ore. Lead ore is rising very considerably, and will, we believe, before six months are over rise very much more. I will now put the report.

A SHAREHOLDER: There are one or two questions I should like to ask before you do that, which I believe it will be interesting to my fellow-shareholders as

well as myself to have answered. How does your average of 14½ cwt. compare with other mines?—The CHAIRMAN: Most favourably. Many mines I could name do not show anything like that average per fathom.

A SHAREHOLDER: What proportion of blends have you in the lead?—The CHAIRMAN: We have no blends at all. Our ore dresses up to an average of 84 per cent. of pure metal. (Hear, hear.)

A SHAREHOLDER: What is the appearance of the lode below the deep adit level?—The CHAIRMAN: We have sunk a winze about 12 fms., and we have there a lode as rich as we have seen in any other part of the mine. In one place it was worth more than 2 tons to the fathom. We have done very little work here at present, because it does not come within our plan of arrangements to touch the lode below the level of the deep adit for many months to come. We are at present prosecuting important works to the east, and if we find what I have every reason to believe we shall a new shaft will be sunk with the intention of ultimately developing the lode below the level of the deep adit, and it is generally believed that we have a far richer mine below the deep adit than we have had above it. I will now put the report.

The motion was carried unanimously.

The CHAIRMAN announced the retirement from the board of Mr. Simmers owing to the distance at which he now resides from London, and recommended for election in his place Mr. W. Bowman, a gentleman of great mining experience, whose services would be very valuable to the company.

Mr. WATSON seconded the motion, which was agreed to nem. con.

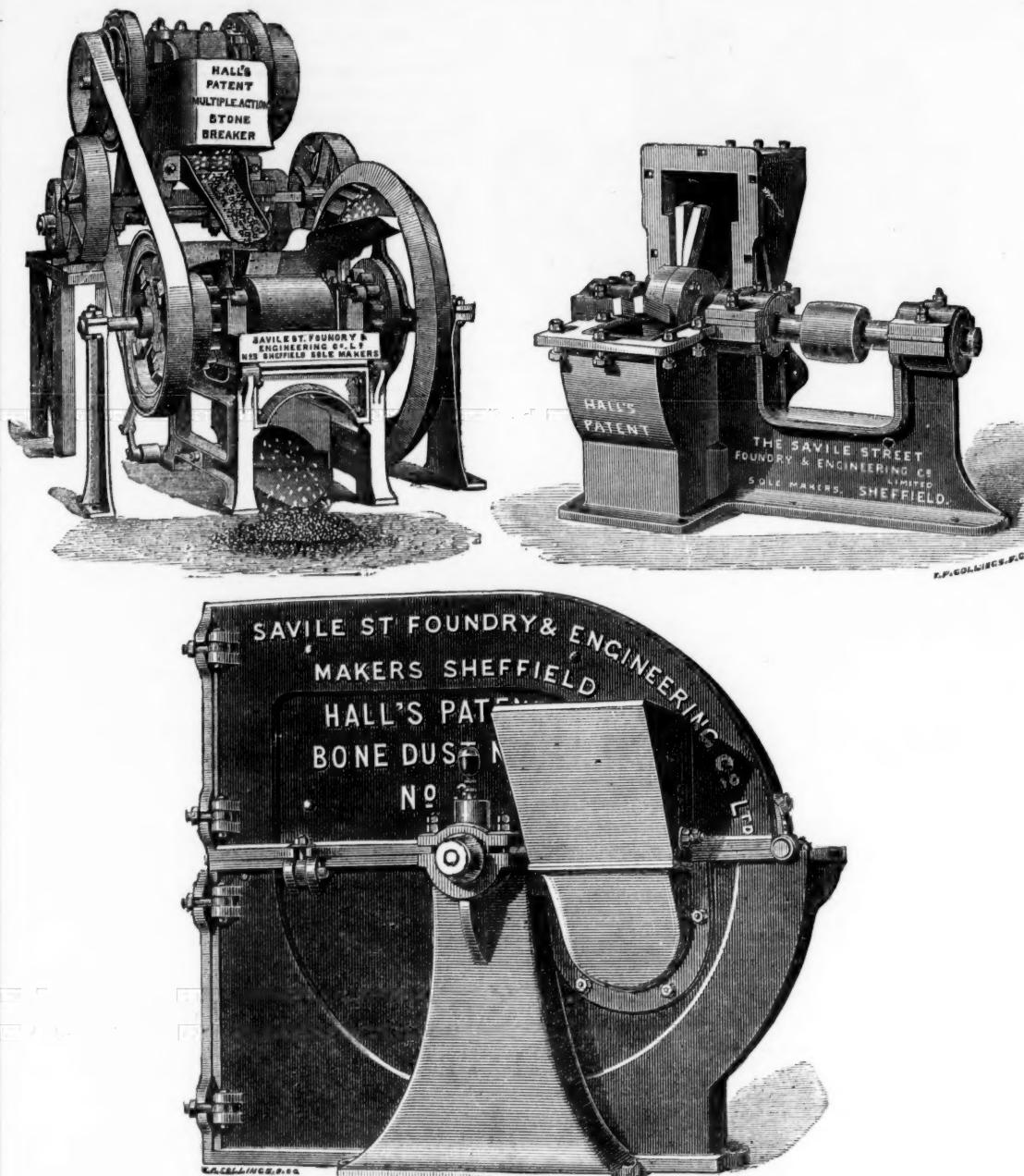
Mr. BOWMAN, in returning thanks, said he was no stranger to this mine. He had repeatedly visited it in his capacity of a shareholder interested in mining matters, and he should now devote his utmost exertions to its welfare.

On the motion of Mr. BROOKES, seconded by Mr. WATSON, the Chairman and Mr. Owen were re-elected directors.

The CHAIRMAN said that amongst several letters received from shareholders one asking why he did not raise and sell 200 tons of lead a month. He would be only too happy to do so if he could. (Hear, hear, and laughter.) The Chairman also referred to some other letters he had received, and concluded by saying that he would resume his duties

## IMPROVED MINING AND COLLIERY MACHINERY.

MULTIPLE-ACTION STONE-BREAKER AND CRUSHING ROLLS—DUST, FUEL, AND BARYTES INTEGRATOR.  
(HALL'S PATENTS.)



It is comparatively few years since that the stone-breaker, as part of a mining plant, was altogether unknown, although at present it is regarded as an absolute necessity, and not only so but mine captains and mining engineers entrusted with the management of mines are now most particular in selecting machines embodying the latest improvements. The novel features in the crusher represented in the first of the above engravings are—the portability of the crushing plant here illustrated, making it applicable for all mines just opening out and where their value has to be tested with the least expenditure of capital. What a portable engine is to a contractor for his varied purposes, so the possession of one of these portable crushing plants is to the mining company who are making trials over their property. Its cheapness, as compared with any existing plant doing the same work, and its special adaptation to foreign mines where cost of carriage is a serious item and skilled labour very expensive; and its completeness rendering no costly foundation necessary; and the fact that each machine as now made (for they have been largely improved in this respect since the above photograph was taken) is self-contained and independent of all extraneous fastenings or supports, and can, therefore, be set to work by the most unskilled workman from printed instructions in a few hours, renders them extremely useful.

The new stone-breaker is constructed upon the Blake principle for operating the crushing-jaw; but, instead of a single vibrating jaw, as in that machine, worked by a connecting-rod and toggles, exerting all their energy at one period of the revolution of the eccentric shaft, at which moment three distinct operations are performed—to crush the ore, to lift the heavy moving parts of the machine, and to compress a spring powerful enough to return the vibrating jaw 250 times per minute—we have the same principle of eccentric connecting-rod, toggles, and crushing-jaw, but they are divided vertically into two complete sets, and the eccentrics upon the driving-shafts are placed exactly opposite each other, so that each vibrating jaw works independently and alternately, dividing the work into two halves, each half operating at different periods in the revolution of the eccentric shaft, and as a consequence placing the whole of the moving parts in perfect equilibrium, reducing the intensity of the strains nearly 50 per cent., reducing the vibration to *nil*, and consuming fully 30 per cent. less power than any other stone-breaker of less size, as proved by testimonials from actual users. The machine, being self-contained and mounted upon wheels, is easily transported, and requires no fixing, being perfectly steady at 300 revolutions per minute, the absence of vibration rendering it suitable for elevated positions upon a foundation simply strong enough to carry its weight.

Although for the pulverising of hard minerals, such as quartz, granite, limestone, and ordinary ores, the various forms of crushers, stamps, and the like are unquestionably preferable the disintegrator has proved itself to be invaluable in the treatment of barytes, coal, and coke to be used as dust fuel, coprolites, sulphur, and of the various substances which from their toughness are with difficulty reduced to powder by other means. The new disintegrator—Hall's patent—manufactured by the Savile-street Foundry and Engineering Company of Sheffield has several times mentioned in the *Mining Journal*, and the other of the above illustrations represent one of the machines specially designed for the manufacture of small coal for coking purposes, and is calculated to get through a large amount of work, at a small cost for plant, working expenses, power, and wear and tear. It is extremely simple, not liable to get out of order, very strong, and all the wearing surfaces are probably double that in other machines of this class, thereby ensuring less chances of overheating, wear, &c.

The chief features of the invention consist in an improved method of securing to the shaft the beaters, which are fixed together in pairs, and are steel faced, between two turned wrought-iron bosses or plates, keyed to the main shaft, which rotates at about 1700 revolutions per minute. These beaters are fitted between the discs in dove-

tailed recesses, so that there is no possibility of their working loose or drawing out from centrifugal force, and once fitted in they may be re-laid with steel when worn, without disturbing the ends which fit between the two bosses. The corrugated beater-plates are of peculiar form, and fit round the interior periphery of the casing, are easily changed when worn, and require no bolts or other fixings to secure them. The grates are of steel, and are easily changed or replaced by others when a change in the degree of comminution is required. The machine is divided along its horizontal axis, and can be instantly opened for inspection.

It is especially useful in grinding coal, coke, charcoal, &c., for artificial fuel, founders' blacking, or dust fuel for the Danks furnaces, &c.; for grinding lime, sulphur, peat, gas cokes, and other carbonaceous substances required in various processes of manufacture. Self-feeding arrangements are supplied, so that the machine will work regularly for hours without attention, and from its non-liability to derangement it is especially applicable to collieries where it is necessary to grind the coal for coking purposes. By a change of grates the coal may be granulated to any degree of fineness, or by a slight alteration in the delivery arrangement an impalpable powder may be produced. All machines manufactured have these provisions made, and it is only necessary to state what is required to be done, and the quantity, when full particulars may be obtained. Instructions for erecting and working are supplied with each machine. They are made in various sizes to suit every want, and from the universality of the applications no doubt can be entertained that when the machine becomes more widely known it will be very generally adopted.

**ELIMINATING PHOSPHORUS FROM IRON.**—To effect the elimination of the metalloids in iron ores and cast-iron Messrs. MONTBLANC and GOULARD, of Paris, propose an improved process. If a current of steam be passed over iron heated to redness the steam is decomposed into oxygen, which is fixed on the iron, and into hydrogen; and in consequence of its power of occlusion this last gas filters, so to say, through the mass of the metal and penetrates all its pores. Under these conditions the hydrogen which is found in the nascent state is combined with all the metalloids contained in the ores, especially with phosphorus, for forming the gas (phosphoretted hydrogen) which is eliminated in this state. For the application of this process to the dephosphorisation of ores, and also to the elimination of all the other metalloids, there is fitted into the axis of the tuyere of the blast furnace or cupola a cone or nozzle for the introduction of steam, which enters with the air blown in. The injection of the steam should be regulated by means of a cock until the complete elimination of the metalloids, and the pressure of this steam should be greater than that of the air flowing back.

**MOTIVE POWER ENGINES.**—An improved pumping apparatus worked by electricity has been invented by Mr. W. E. IRISH, of Dalston. There is a hollow cylindrical vessel or pump containing a plunger to the rod of which is attached the armature of electro-magnets, between the poles of which it is placed. A fluid is introduced into this pump, and the electro-magnets alternately attracting the armatures force the plunger in and out, and thereby the fluid is forced into or drawn from the working cylinder, which may or may not contain air or gas to form a cushion. One stroke of the piston is effected by the pressure of the plunger while the other is performed by suction and reaction of the compressed air. The accumulator is a suitable vessel fitted with pipes having respectively inlet and outlet valves; it may be fitted to work a weighted piston to compress air or gas, or other fluid, or springs. The fluid pumped into the vessel lifts the weighted piston, or compresses the fluid or springs. In working, the fluid is allowed to escape from the accumulator into the working cylinder, forcing out the piston, which is caused to close

automatically by means of a valve or stop cock, the flow from the accumulator at the same time and by the same means opening an outlet from the cylinder to the reservoir into which the fluid passes, the return of the piston again automatically closing and opening the outlet and inlet pipes. There are cylinders working the ordinary piston, and imparting power in the usual manner; a reservoir, into which the cylinder empties itself, and from which the pump is fed; a regulator for controlling or regulating the speed; and an arrangement by which the electrical path is changed automatically. To work the engine liquid gas, air, or any fluid is first put into the cylinder, which is divided by and according to the number of plungers employed into two or more compartments, each of which may or may not be filled or partly filled with the fluid according to the requirements of the engine. By the action of the plungers the capacity of the compartments are varied and the contents thereby forced into or drawn from the working cylinder.

## GEOLOGICAL SOCIETY OF LONDON.

Jan. 21—HENRY CLIFTON SORBY, LL.D., F.R.S. (President), in the chair.

Robert Bell, Burghley-road, Highgate-road, was elected a Fellow of the Society.—Joseph H. Cowham, Westminster Training College; William Alexander Forbes, B.A., Ashley-place; M. H. Gray, Kuching, Sarawak, Borneo; and Charles Thomas Whitmell, M.A., B.Sc. (Lond.), F.C.S., Havelock-street, Sheffield, were proposed as Fellows of the Society.—Frances Bond, M.A., Snowdon House, John-street, Hampstead; Charles Ernest Cobbold, San Valentino, Abruzzo Citeriore, Italy; Frank Crisp, LL.B., B.Sc., F.L.S., Lansdowne-road, Notting Hill; William Henry Dover, Myrtle Grove, Keswick; Mirza Mehdy Khan, Chudder Ghaut, Hyderabad, Deccan, India; John Notman, Parliament Buildings, Toronto, Ontario; and John Evelyn Williams, C.E., Boston, Lincolnshire, will be balloted for as Fellows of the Society.

The following communications were read:—

1.—“On the Genus *Pleuracanthus*, Agass., including the Genera *Orthacanthus*, Agass. and *Goldf.*, *Diplodes*, Agass., and *Xenacanthus*, Beyr.” by J. W. Davis, F.G.S.

2.—“On the Schistose Volcanic Rocks occurring on the West of Dartmoor, with some Notes on the Structure of the Brent Tor Volcano,” by Frank Rutley, F.G.S.

3.—“On Mammalian Remains and Tree-Trunks in Quaternary Sands at Reading,” by E. B. Poulton, F.G.S.

The next meeting will be held on Feb. 4, when the following papers will be read:—1. “On the Oligocene Strata of the Hampshire Basin,” by Prof. John W. Judd, F.R.S., Sec. G.S.—2. “A Review of the Family Diastoporidae, for the purpose of Classification,” by George Robert Vine.—3. “On a new Theriodont Reptile from the Upper Pernian cupiferous Sandstones of Kargalinsk, near Orenburg, in South-Eastern Russia,” by W. H. Twelvetrees, F.L.S., F.G.S.

## FOREIGN MINING AND METALLURGY.

A contract has just been let at Hanover for about 800 tons of Bessemer steel. The contract was obtained by an Oberhausen company at 10*l.* per ton. An adjudication for rails and iron sleepers has taken place at Munster; the Osnabrück Company submitted the lowest tender for rails—9*l.* 18*s.* per ton. As regards iron sleepers, the Osnabrück Works tendered at 9*l.* 16*s.* per ton. Throughout Germany there appears to be almost unlimited confidence in the present revival in affairs. An Oberhausen circular gives 10*l.* per ton as the basis price for rolled iron. A congress has been officially convened in Russia next month to concert measures for providing Russian steel rail manufacturers with the requisite supplies of pig.

In the Haute-Marne (France) prices of almost all descriptions of iron continue to advance. No. 3 second fusion pig has made 5*l.* 4*s.* per ton. The price of rolled iron from charcoal-made pig was carried at the close of last week to 9*l.* 4*s.* per ton. Rolled iron from charcoal-made pig has made 10*l.* per ton. Large plates have been quoted at 10*l.* 16*s.* to 11*l.* 4*s.* per ton. Axles have been in good demand, at 8*l.* 16*s.* per ton. An advance in prices, however, is imminent. In the Meurthe-et-Moselle refining pig is worth 4*l.* 4*s.* to 4*l.* 8*s.* per ton. No. 3 pig for second fusion is worth 4*l.* 8*s.* to 4*l.* 16*s.* per ton. In the Ariège the various descriptions of iron have advanced 1*l.* 4*s.* per ton during the past month.

In Belgian circles a good deal of attention is being devoted just now to an impending adjudication for 100 locomotives and 2000 trucks for the Belgian State Railways. Prices of Belgian iron of various descriptions have remained at nearly the same point. The basis price of iron at Charleroi is 8*l.* 16*s.* per ton, with the usual scale per ton per number. The Angleur Steelworks Company has just completed a second converter on the Thomas-Gilchrist system. A contract has just been let for the delivery of 5000 tons of steel rails, and a considerable quantity of accessories to the Netherlands State Railways. The lowest tender was delivered by the Bochum Company, but as that concern was not willing to abide by all the conditions of the specification the contract was passed to the Angleur Steelworks Company.

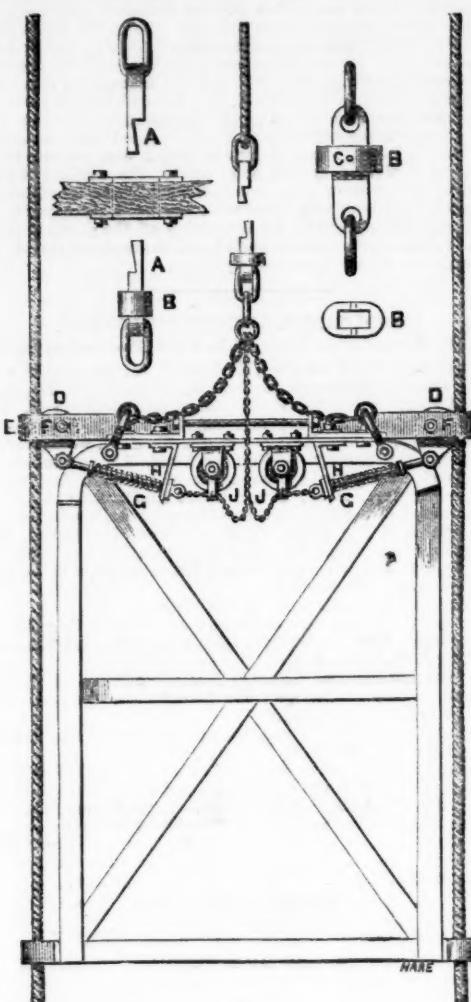
There is little new to report with respect to the Belgian coal trade. Prices are maintained, but they have not advanced; on the other hand there has been no downward movement. The Belgian glass trade is moving on favourably; the sugar making season promises well. The revival of industry has become more decided, and the winter itself is as rigorous as coalowners could wish it to be. All these circumstances are calculated to support Belgian coal quotations. An adjudication has just taken place at Mons for 1200 tons of coal required for the Belgian State Railways. The Levant du Flénou Company submitted the lowest tender—1*l.* 1*c.* per ton.

As regards other items of coal news, we may add that a contract for coal has been concluded by the Northern of France Railway Company with the Lens and Anzin collieries. The price named in connection with this contract is 9*s.* per ton. A league of German colliery proprietors, which proposes a reduction of 5 per cent. on the output of coal in Germany in 1880, now comprises 95 per cent. of the German collieries. Such an advance may, however, be witnessed in German coal quotations that it may become more profitable for a German colliery company to pay a fine rather than to reduce its extraction. A reduction in the production of coal in Germany is certainly probable this year, but it is not absolutely certain.

**WAGES AT THE AUSTRALIAN GOLD MINES.**—A very uneasy feeling has been created among the gold mine owners of the Sandhurst district, in the colony of Victoria, where a strike has existed for some considerable time for higher wages on the part of the miners. The strike has now come to an end, the owners, according to the Australian, having decided to resume operations at standard wages for day labour; as, owing to Government interference, they had to choose between submission and confiscation, and selected the latter evil. To save their property they are forced to pay a rate of wages at which they declare their claims cannot be profitably worked; and they have recorded a vigorous protest against the coercive attitude assumed by the Minister of Mines in singling out certain claims worked continuously, while for many years hundreds of lessees have employed no men at either low or high wages.

**ECONOMIC TREATMENT OF BLENDE AND PYRITES.**—A new process of extracting metals, such as copper, zinc, and silver from decomposed pyrites and blende which have been roasted for the manufacture of sulphuric acid or sulphur, has been patented by Messrs. Wegelin, Hübler, and Pollack, of Halle-on-the-Saale, Germany. The metals are extracted by ammonia or carbonate of ammonia at a temperature which should not exceed 45° Centigrade, after which the copper and silver are precipitated from the so obtained ammoniacal solution by zinc. The zinc extracted from the roasted mineral as well as that which has been dissolved for precipitating the copper and silver is then precipitated and completely recovered as a sub-carbonate or hydrated oxyde by distilling the ammoniacal solution with superheated steam. The regeneration of the ammonia and of the carbonic acid is effected by another process patented by the same inventors about a twelvemonth since.

PREVENTION OF SHAFT AND OVERWINDING ACCIDENTS.



It has frequently been contended that all accidents from overwinding or from breakage of winding ropes ought to be classed as preventable, because safety catches and detaching hooks might be provided in all cases, and the inventions of this class are really so numerous that there should be no excuse for not adopting one or other of them. Amongst the most efficient of these may be mentioned the safety apparatus invented by Mr. F. Leonardt, of Birmingham, and now being extensively introduced in the Staffordshire and other districts by Messrs. Johnson and Co., of Dudley. The Leonardt apparatus, which has the double advantage of preventing overwinding and preserving the cage from falling down the shaft in case of breakage of the rope, consists—first, of a detaching hook, composed of two wedge-shaped plates, A A, each fitted with eyes, to which the shackle of the rope and the ring of the cage are attached by means of D-links. In working position the two wedges are placed together in opposite directions, forming a rectangular-shaped exterior, over which a strong collar, B, is slipped, and held in place by a copper metal pin, C, passing through it and the wedges. When the whole weight of the cage is brought upon the hook the tendency is for the wedges to part, but they are perfectly locked by the collar—the greater the weight the tighter the lock, and the only relief possible is when, in case of overwinding the collar comes into contact with the cross-head on the pit-frame, and is slipped down off the wedges, shearing the pin, and permitting the rope to go over the pulley, and the cage to the bottom of the pit, but for the arresting apparatus attached to the cage. This latter apparatus consists of two eccentric levers, D D, or cams, fitted into a sort of collar, E E, which works on the wire guide ropes. The peripheries of the cams are grooved, F F, to fit the guide rope, and press them against the collar working round them in action. Attached to the back of each cam is a rod, G G, surrounded by a spiral spring, H H, and this is kept in tension, at the same time holding back the cams from guide ropes, by means of chains running round small pulleys, J J, up to the cage chains. When the rope is detached in overwinding, or breaks, the chains are immediately relieved, and the springs force the cams forward, causing them to press the guide ropes against the collars. The friction also acts on the eccentric form of the cams, and the greater the weight the more force is exerted upon the guides, so that the cage is firmly held. As the apparatus is alike applicable to wire rope or wood guides it might readily be introduced at every colliery not already provided.

The correctness of the principle upon which Mr. Leonardt's invention is based has been proved by the experience of a quarter of a century, so that the fears which were at first entertained that the pin which holds the collar in place would not be cut, and that the eccentric which catches the guide when the rope is broken would fail must have been long ere this entirely dispelled. Even in the Aytoun cage, which had been in use long previously to the International Exhibition of 1862, it was found that there was so little shearing action on the pin until the plates were brought within the crosshead ring that a tightly-rolled sheet of paper could be substituted for the metal, and in most of the improvements since the chances of accidental shearing action has been still further reduced. It will be seen from the above that there is never any appreciable shearing of the pin C, because the inclined planes marked A, shown above and below the cross-head, are kept in position not by the pin but by the collar B, which remains immovable except in case of overwinding, when the pin is cut off by the collar being brought against the cross-head. Similar remarks will apply to the eccentric which, in case of breakage of the rope or detaching through overwinding, supports the cage of the guides. The White and Grant's cage on the same principle is largely used both in this country and in Germany, and has proved thoroughly reliable, and Mr. Leonardt's improvements render the arrangement as nearly perfect as may be desired. The Leonardt apparatus has been severely tested, and has never been known to fail. In one instance the collar was knocked off the detaching hook to represent the breaking of the rope. The brake acted admirably, the cage with a load of about 22 cwt. of castings stopped instantaneously, and not a scratch could be detected on the guide rope. For two following trials the load was increased to above 2 tons, or three times the weight of an ordinary load, and when the engine wound up the cage to the cross-beam the collar slipped off the plates and so detached them, but the cage stuck as firm as a rock, and did not seem to have dropped an inch. With such an apparatus in the market, and especially as the price at which it is offered is very reasonable, overwinding and rope-breaking accidents resulting in loss of life should be no longer heard of; or, should they happen, the utmost efforts should be made to make those who have neglected to provide safety apparatus criminally responsible.

# PATENT BRIQUETTE MACHINE

GREAT SAVING NO WASTE COAL.

NO COLLIERY SHOULD BE WITHOUT.

These Machines utilise smudge or small coal by making it into Briquettes or blocks of compressed fuel at the rate of 36,000 per day. The cost of preparing, mixing, and making is under One Shilling per ton. The Briquettes sell readily for Locomotives, Household, or other purposes. Full particulars on application to

**YEADON AND CO.,  
ALBION PLACE, LEEDS,  
ENGINEERS, AND CONTRACTORS**

FOR EVERY DESCRIPTION OF PLANT FOR

**Collieries, Mines, and Brickworks,**

## TESTIMONIALS.

Messrs. Yeadon and Co., Leeds.  
I continue to be perfectly satisfied with the work performed by the two patent Briquette Machines as well as with that of the Steam Engine, Mixer, &c., which you supplied a few months ago for the manufacture of compressed slack Briquettes, and that I can recommend them as being the best machines I know of, after having carefully studied all the Briquette Machines constructed at home and abroad.

(Signed)

G. FAGES, General Manager for the Bernissart Collieries.

Messrs. Yeadon and Co., Leeds.  
I continue to be highly satisfied with the Briquette Machines which you supplied in 1877. They do their work very well, and produce the Briquettes very regularly, and of a good quality.

(Signed)

G. FAGES, General Manager.

I have the honour to inform you that we are entirely satisfied with the erection and working of the two Briquette Machines as well as the Steam Engine and Mixing Apparatus.

(Signed)

A FRANEAU, Managing Director to the Ille du Cœur et de la Boule Collieries, Quaregnon

## INCREASED VALUE OF WATER-POWER.

### MacADAM'S VARIABLE TURBINE.

This Wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and in this way always assists it by whatever amount of power the water is capable of giving, and therefore saves so much fuel.

This Turbine is applicable to all heights of fall. It works immersed in the tail-water, so that no part of the fall is lost, and the motion of the Wheel is not affected by floods or back-water.

References to places where it is at work will be given on application to—

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**SAFETY FUSE,  
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PRICES ON APPLICATION



**GEOLGY.**—In the Preface to the Student's Elements of Geology, by Sir CHARLES LYELL, price 9s., he says—"As it is impossible to enable the reader to recognise rocks and minerals at sight by aid of verbal descriptions or figures, he will do well to obtain well-arranged collections of specimens, such as may be procured from Mr. TENNANT (149, Strand), Teacher of Mineralogy at King's College, London." These collections are supplied on the following terms, in plain mahogany cabinets:—

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**ACCIDENTS CAUSE LOSS OF TIME,**

And may be provided against by a Policy of the

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The oldest and Largest Accidental Assurance Company.

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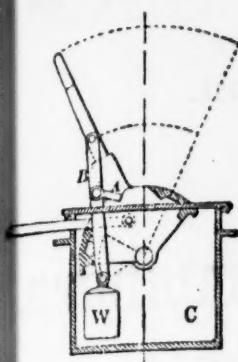
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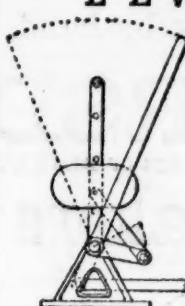
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Hartley's Patent Lever Box,  
REVERSIBLE UNDERGROUND,

Can be set to work either way; by turning over the catch at A and reversing the lever, the weight W swings over to C, the catch preventing its return until again turned over. The reversing is effected with very little power, as the weight is raised but a few inches in the operation.

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Will act over both ways, can be locked so as to work on one side only, or the switches can be locked on either side, so as not to work at all. Takes up less room than any other, as the weight does not turn over; works equally well if full of water; can be supplied at the price of an ordinary lever box.

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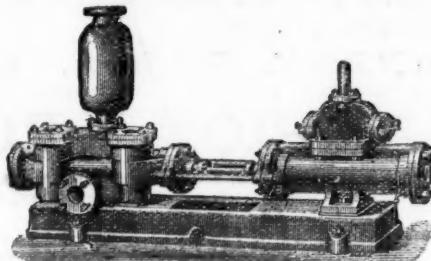
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STEAM PUMPS,

MADE IN ALL SIZES AND  
COMBINATIONS.



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Steam cylinder.	Water cylinder.	Stroke.	Gallons per hour.	Price.
3	1½	12	720	£16
4	2	18	1,260	19
4	4	18	5,040	25
6	4	18	4,280	33
6	6	18	9,660	41
8	6	18	7,920	50
10	8	18	12,060	60

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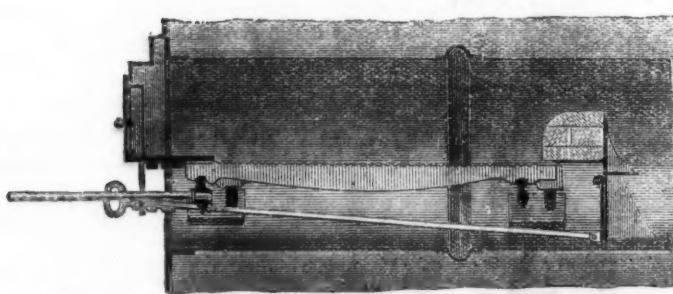
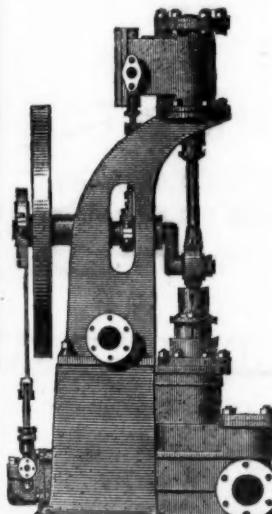
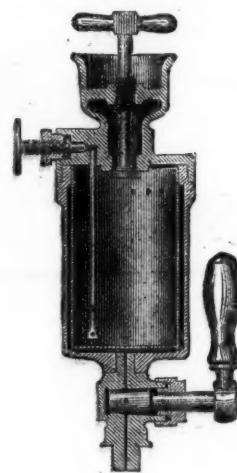
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Entirely Self-acting. Flow of Grease regulated  
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Greatest possible Economy.

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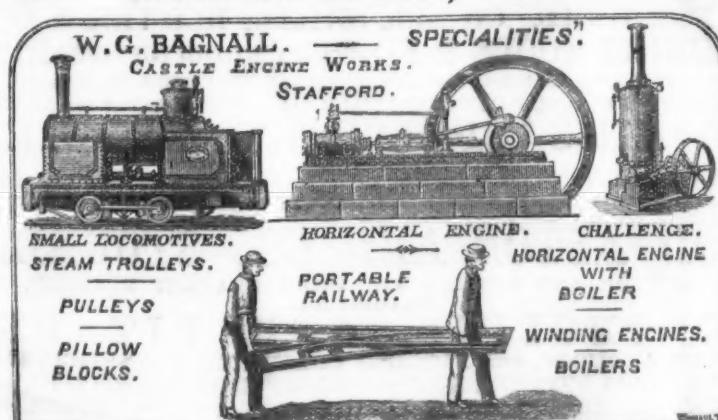
FLUE  
OR  
FURNACE.

PRICES  
ON  
APPLICATION.

### PRICES OF LUBRICATORS.

No.	Horse-power.	Price.
1	Agricultural Engines...}	7s. 6d.
2	5 to 7	10 0
3	7	20 0
4	10	25 0
5	20	30 0
6	30	37 6
7	50	47 6
8	70	60 0
9	100	85 6
10	200	110 0

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SUITABLE FOR PIT BANKS, ENGINE HOUSES, &c., &c.

Each Lamp gives a light equal to

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No Breakage of Chimneys from

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Cottons last three months.

Will burn any Mineral Oil.

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FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.**

Stones broken equal, and Ores better, than by hand, at one-tenth the cost.

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**Improved Patent Stone Breakers & Ore Crushers**

New Patent Reversible Jaws,  
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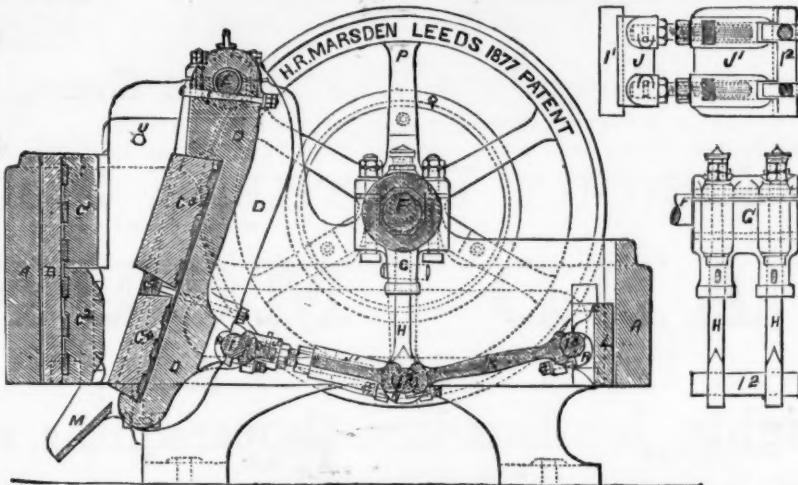
NEW PATENT ADJUSTABLE  
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OVER 2500 IN USE.

New Patent Draw-back  
Motion.

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70

PRIZE MEDALS.

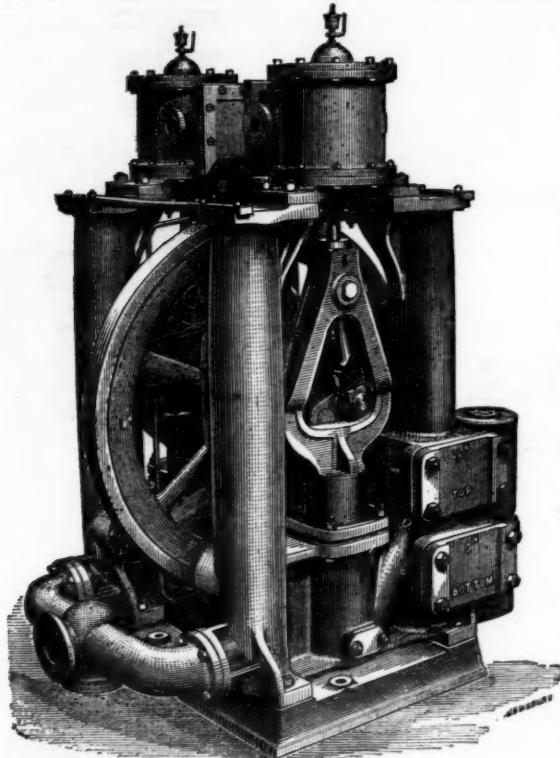


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Wharthon Lime Works, Maryport, Whitehaven  
November 7, 1873.  
H. R. MARSDEN, Esq., Soho Foundry, Meadow-lane, I  
size, 24 in. by 19 in. The quantity we are breaking daily  
this one machine is 250 tons, the jaw being set to break  
size of 3½ in. We have, however, frequently broken  
300 tons per day of ten hours, and on several occasions  
330 tons during the same period. The stone we break  
blue mountain limestone, and is used as a flux in the  
ironworks in this district. We have now had this machine  
daily use for over two years without repairs of any kind  
have never had occasion to complain of any inconvenience  
using the machine. I hope the one you are now making  
we may do its work equally well. The cost—including  
GIVE-POWER, COALS, ENGINEER, FEEDING, and all EXPENSE  
OF EVERY KIND—is just 3d. per ton. Should any of your  
friends feel desirous of seeing one of your machines at  
I shall have much pleasure in showing the one alluded to.

I am, dear Sir, yours very truly,

WILLIAM MILLER

**AND THIS—**

Wharthon Lime Works, Aspatria, Cumberland  
July 11th, 1873.  
H. R. MARSDEN, Esq., Soho Foundry, Leeds.  
DEAR SIR.—We are in receipt of your letter of 4th inst  
may just state that the stone breaker above named has  
under my personal superintendence since its erection, and  
have no hesitation in saying that it is as good now as it was  
five years ago.

I am, dear Sir, yours faithfully,

FRANCIS GOOD

**THE "CHAMPION" ROCK BORE**

MINE AND QUARRY STANDS, STEEL DRILLS, SPECIALLY PREPARED INDIARUBBER HOSE, TESTED  
IRON PIPES, &c.

**Air-Compressing Machinery,**



Simple, strong, and giving most excellent results, and  
ELECTRIC BLASTING APPARATUS.

Full particulars of rapid and economical work effected  
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